Springlocks—A NEW HY-CROME PRODUCT

• HY-CROME *Springlocks* successfully meet the increased demands of higher train speeds and greater wheel impact loads in keeping track joint bolts tight. They automatically compensate for looseness resulting from increased stress, wear and vibration, and maintain a correct bolt tension. HY-CROME *Springlocks* are now being exhibited and their advantages explained at Booth No. 52 at the National Railway Appliances Association Annual Exhibit in the International Amphitheatre, at Chicago, during the A. R. E. A. convention. Our sales engineers will be very pleased to call upon request.

EATON MANUFACTURING COMPANY

RELIANCE SPRING WASHER DIVISION

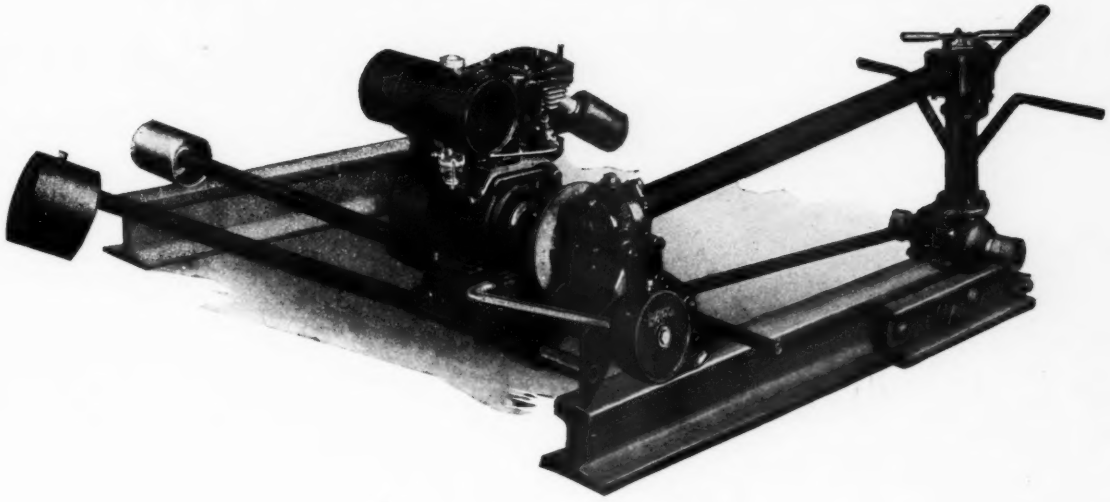
MASSILLON, OHIO

Sales Offices: New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco, Montreal

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933 at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

Use

Raco Power Track Machine



When

Tightening out of face.

Removing worn rail.

Installing new rail.

Changing angle bars.

Shimming angle bars.

Tightening frog bolts.

Welding rail.

Grinding or slotting rail.

Installing screw spikes.

Because

It saves its cost in approximately 35 working days.

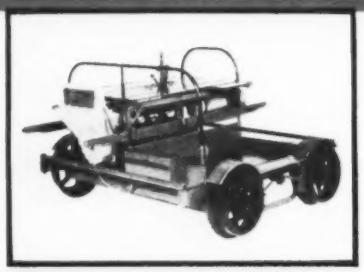
And because machine tightening has the following very important advantages:

Puts uniform tension on all bolts.
Costs one-third of hand tightening.
Lasts more than twice as long.
Greatly reduces rail batter.
Prevents frozen joints.
Saves joint ties.
Reduces angle bar wear.
Extends tamping periods.
Makes better riding track.
Hence saves rolling stock.
Confines expansion to individual rails.
Extends life of signal bonds.

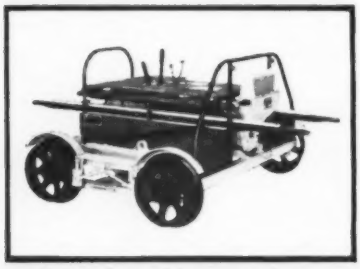
RAILROAD ACCESSORIES CORPORATION

MAIN OFFICE
405 LEXINGTON AVENUE
(Chrysler Building)
NEW YORK

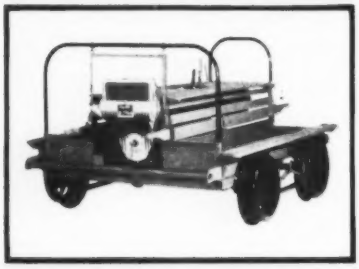
Years Ahead in Design



Fairmont 59 Series D. One-to-two man oak frame car with extra wide tray. Fairmont RO 5 to 8 H.P. engine. Ask for bulletin 394.



Fairmont M9 Series D. Seats 2 men. Spring-mounted aluminum frame. Rear lift only 95 lbs. Fairmont RO 5 to 8 H.P. engine. Ask for bulletin 391.

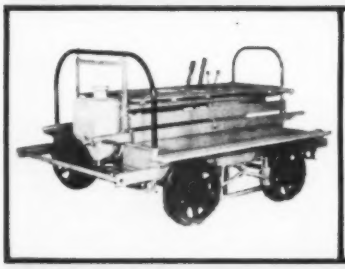


Fairmont M14 Series G. Six-man section car, light enough for one-man inspection service in off seasons. Rear lift 105 lbs. Fairmont RO 5 to 8 H.P. engine. Bulletin 397.

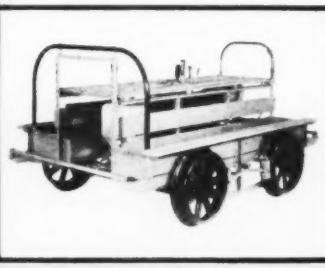
Fairmont has always been first with improvements that make for greater safety, more economical service, more reliable performance and easier riding. Fairmont Railway Motor Cars today are finer than ever. They embody the most advanced features . . . and there's a Fairmont car of the right seating and load capacity for every hauling requirement. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

Fairmont M19 Series E

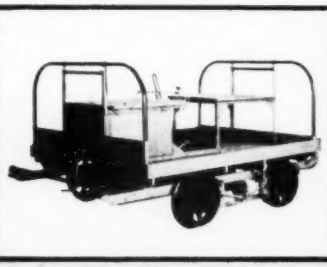
Seats 4 men—Safe for 1. Rear lift only 95 lbs. Spring-mounted aluminum frame. Demountable wheels. 4-wheel brakes. Fairmont ROA 5 to 8 H.P. roller bearing engine. Fairmont Endless Cord Belt Drive with finger tip control. Ask for bulletin 396.



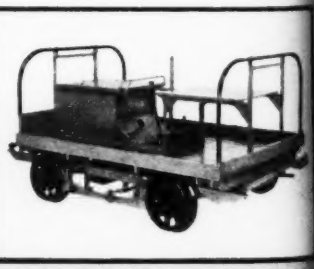
Fairmont S2 Series F. Steel frame standard section car. Seats 8 men, hauls 2 trailers, loaded with men and tools. Fairmont RO 9-13 H.P. engine. Ask for bulletin 394.



Fairmont S2 Series G. Heavy duty steel frame section car. Seats 10 men, hauls 2 loaded trailers. Fairmont RO 8 to 13 H.P. engine. Ask for bulletin 396.



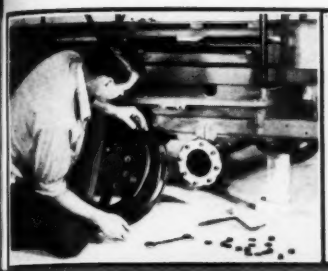
Fairmont A3 Series C. B & B and extra gang car. Can carry 2000 lbs. and tow three trailers loaded with 60 men. 20 H.P., 4 cyl., 4 speed engine. Bulletin 402.



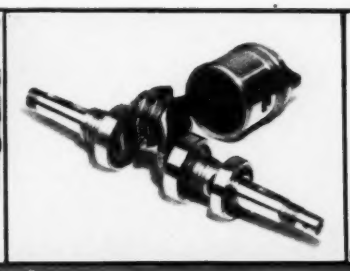
Fairmont A5 Series C. For the biggest jobs and longest hauls. Tows one to seven trailers. Removable body. 4 cyl., 4 speed, 36 H.P. engine. Ask for bulletin 385.

OF ALL THE CARS IN SERVICE TODAY

Fairmont MOTOR CARS HAVE THE FEATURES WHICH SERVE YOU BEST!

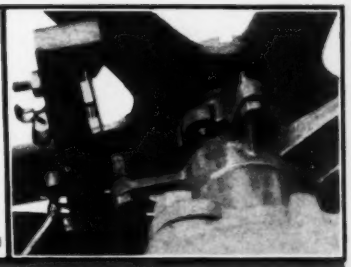


...removable wheels permit quick replacements when tires become worn as they can be removed without pulling the hub from the axle and without the risk of damaging the wheel insulation or the axle.



Three bearings, instead of two, keep the crankshaft rigidly aligned. Two flywheels further assure perfect balance and enable Fairmont engines to develop more horse power than any others of equal H.P. rating.

In keeping with Fairmont's policy of making all wearing parts easily accessible, the seat tops are either removable or hinged to lift out of the way. Minor repairs can be made quickly right on the job.

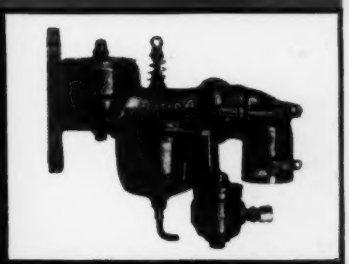


The adjustable spark which permits higher speeds and greater pulling power in Fairmont engines is controlled by a long-blade, long-wearing timer that provides perfect contacts with self-cleaning slide action.

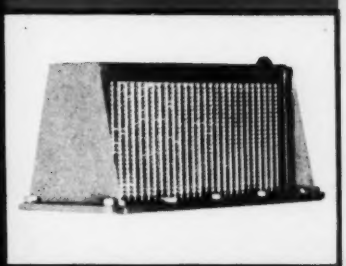
FAIRMONT ENDLESS CORD BELT TRANSMISSION

The superior advantages of the Fairmont Endless Cord Belt drive with "finger tip" control have been proved by many years of service on thousands of cars. This advanced Fairmont feature is your assurance of smoother starting, greater power and more economical and dependable performance.

Performance ON THE JOB COUNTS



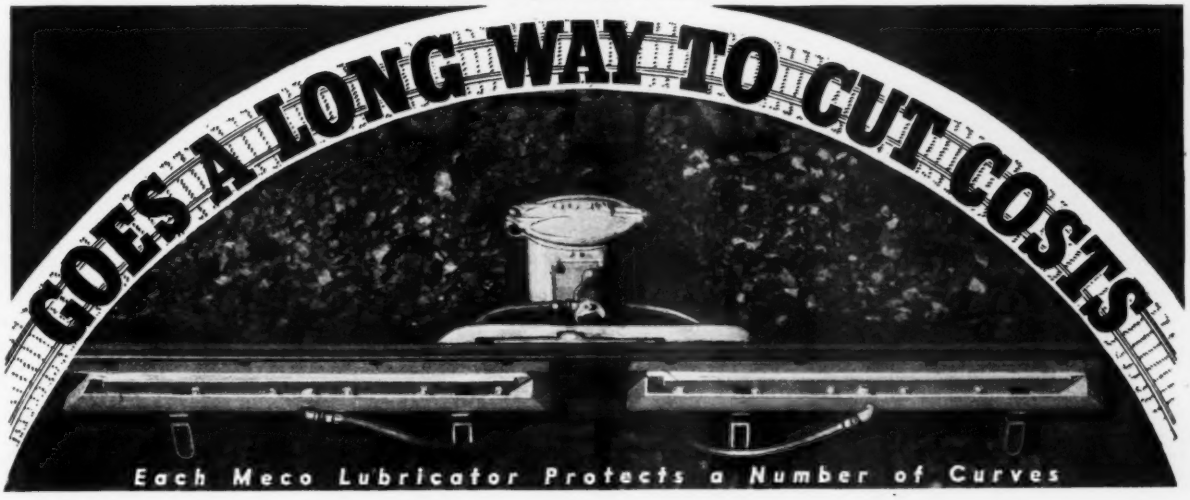
Quick starts in cold weather are the rule thanks to the advanced design of the Fairmont carburetor. Handhole cover, check valve chamber and carburetor bodies are one piece, with all vital parts accessible.



Fairmont engines have thermo-syphon Water completely surrounding cylinder head dissipates heat quickly via the large cooling surface of jacket. Steam from the water is instantly condensed, conserving the supply.

By standardizing the dimensions of many wearing parts, Fairmont facilitates maintenance and minimizes your investment in repair part inventories. A few sizes, instead of many, service all Fairmont cars.

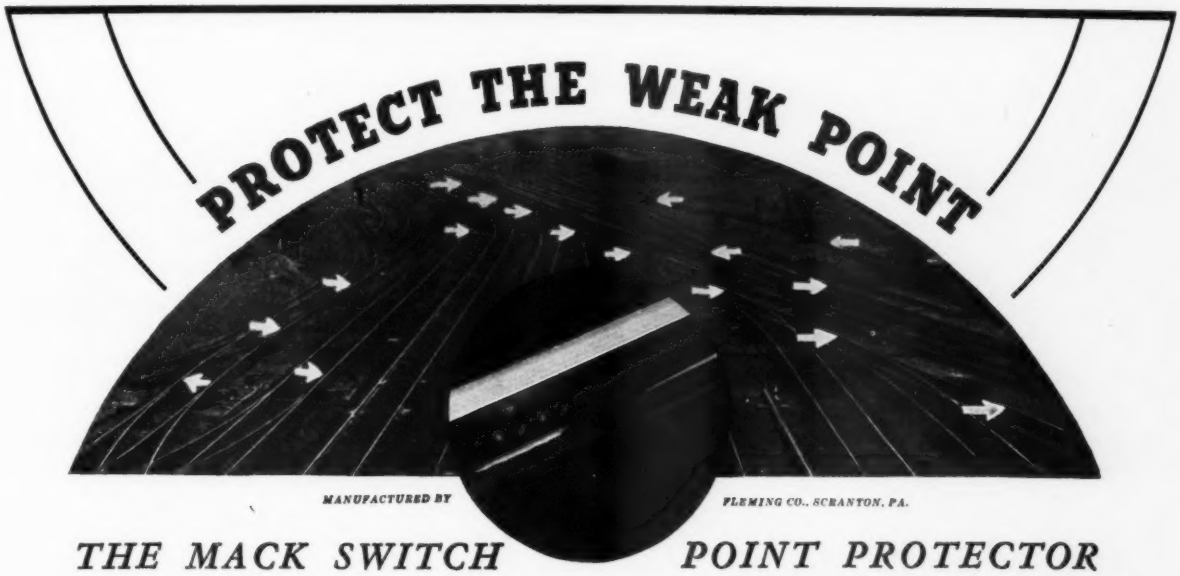
MORE THAN HALF ARE Fairmont



ONE MECO LUBRICATOR

Extends its expense-reducing protection to several curves

- Reduces cost of maintaining gauge and line on curves.
- Decreases replacement cost by prolonging curve-rail life.
- Decreases train resistance—cuts fuel costs.
- Prevents wheel screeching on curves.
- Increases safety of train operation and permits higher speeds.
- Often eliminates helper service or permits higher tonnage ratings, where curve resistance is governing factor.



MANUFACTURED BY FLEMING CO., SCRANTON, PA.

THE MACK SWITCH POINT PROTECTOR

The point of the switch rail is subjected to maximum impact and wear in deflecting wheels at switches; yet it is the weakest part of the switch rail, being only 1/10 as thick as the heel.

The Mack Switch Point Protector corrects this inequality by taking the excess load off the point and making it last as long as the heel. Result—Switch rail life is prolonged 6 to 8 times.

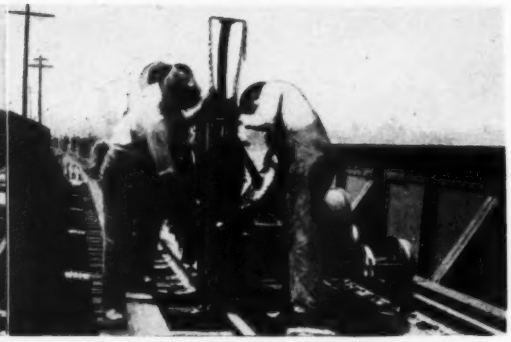
Reversible.—When the Mack Switch Point Protector wears down, one man takes it off, reverses and reapplies it in a few minutes, after which it gives the same protection as when new.

Visit us at Booths 54 & 69, N.R.A.A. Exhibit

A Complete Line of Power Tools f

Adzing Machine

Leaves all tie seats level and in same plane. Less possibility of damage to new rail caused by uneven bearing on ties. New rail should only be laid on machine adzed ties. This machine is valuable when re-gauging curves.



Spike Puller

One machine will pull from 35 to 45 spikes per minute. Equally fast on bridges and trestles. Will pull spikes which claw bars can not get. Lessens the possibility of accidents incident to spike removal. Cuts rail laying costs.

Power Jack

With the one operator, this machine easily keeps ahead of any tamping gang. Speed, power and accuracy of lift makes it essential for every ballasting and surfacing job.

Track Shifter

For shifting track laterally on construction jobs, waste dumps, etc., or for raising track vertically on fills, elevation projects and stock-piling of materials, this machine easily replaces a large gang of men working with jacks and bars.

Rail Drill

Use this fast, simple, rugged tool wherever rail must be drilled. Useful on both rail laying and maintenance jobs.

NORDBERG

for Your Track Maintenance Jobs

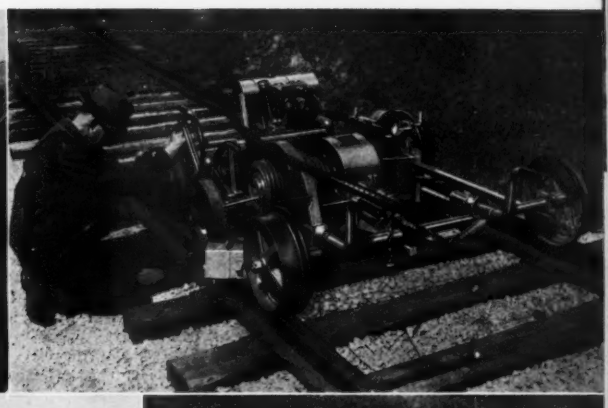
Track Wrench and Accessories

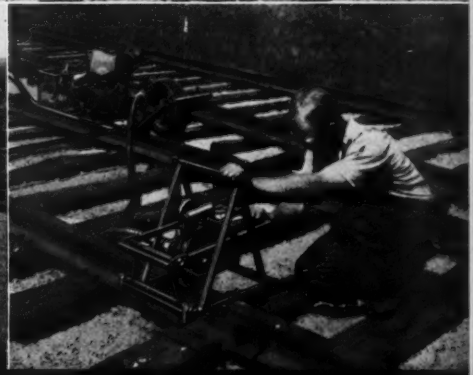
This fast, powerful, light weight, sturdy wrench is adaptable for either rail laying or regular maintenance tightening. It is full revolving — operator always faces traffic. Gets to most nuts at switches, frogs and crossings. Two men easily remove it from track. Spring loaded overload release assures of uniform expansion at every joint. This machine can also be used for drilling rail and for boring for screw spikes by applying the special, easily attached accessories developed by Nordberg.

●

Grinders

Four types of rail grinders available, all adapted for driving accessory attachments. Models include a machine for heavy duty production; a light weight design for terminal work; a grinder where extreme accuracy is essential, and then there is the general utility machine which, with accessories, can be used for rail end slotting, grinding switch points, frogs and crossings.





G MFG. CO., MILWAUKEE WISCONSIN

Duff-Norton Genuine Barrett Single Acting Track Jack No. 117 has a suspended pawl design which eliminates the use of a separate tripping device. Pawl cannot jump out of its bearings as in other Jacks of this type.

Duff-Norton

THE FAVORITE RAILROAD JACKS FOR FIFTY YEARS

Through more than two generations of railroad trackmen, Duff-Norton has been a familiar and trusty tool . . . time-tried and proved as the safest, strongest and longest lasting track jacks obtainable. As a result, you find them faithfully serving on virtually every railroad right of way today, recognized as the railroad standard.

Designed with the one and only genuine Barrett Mechanism and amply reinforced at points of greatest strain, the Duff-Norton Line of Track Jacks represents the finest investment in track tools that money can buy.

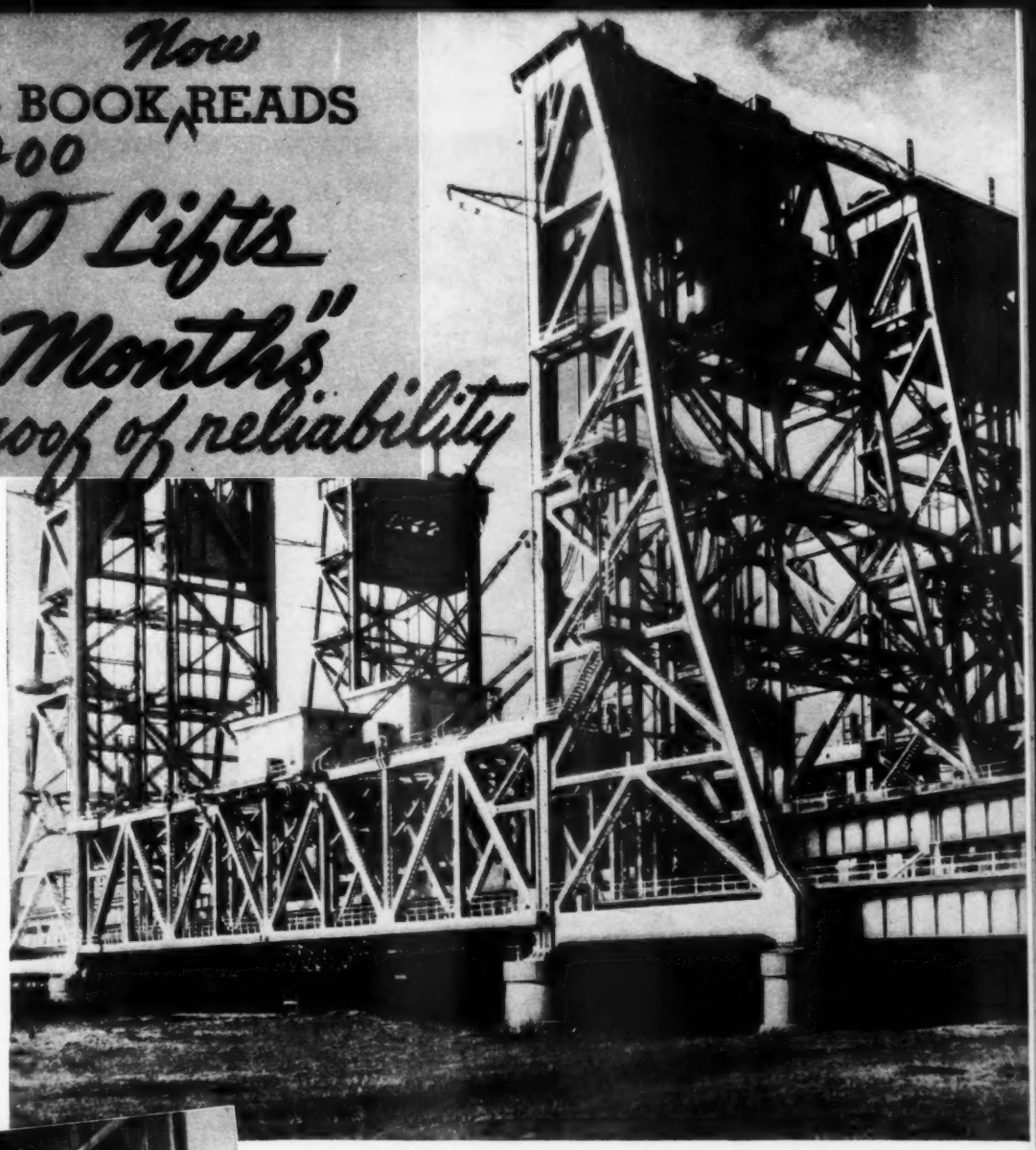
THE DUFF-NORTON MFG. CO.

"The House That Jacks Built"

PITTSBURGH, PA.

Now THE LOG BOOK READS 22,400 "13,500 Lifts 35 in 16 Months"

More proof of reliability



That's the Job G-E Electric Drive Does on the Nation's Busiest Railroad Lift Spans

Duplicate motor-generator sets, duplicate frequency changers, and switchgear for operation of the bridge, and for supplying power to Newark station

ONCE an hour and oftener, the three spans of the Pennsylvania's great lift bridges at Newark must be raised to permit traffic on the Passaic River to pass through. This is done in the face of extremely heavy six-track rail traffic across the spans—almost a continuous flow during the busy hours. No wonder, then, that reliability above all else is demanded of the mechanism lifting the spans.

Electric drive was the logical choice for the lifting job—the same drive which has proved so dependable for many other railroad applications. Swiftly, smoothly, and with no delays, this drive does its work—responsive to every touch of the operator in the control tower. And again the confidence of railroads in electric drive has been amply justified.

We are proud to have supplied the main electric units which operate this bridge. General Electric Company, Schenectady, New York.

GENERAL ELECTRIC

Filing No. 9100 98-573

Streamlined trains and schedules call for STREAMLINED TRACK

At 100 m.p.h. full coffee cups, pleasant reading in the lounge, everybody relaxed—maintaining this ideal condition permanently calls for *properly supported* track.

When Concrete Track Support is used, wheel loads are spread sufficiently to maintain a *practically uniform top-of-rail profile*, even under the weight of locomotive drivers.

Smoother going, with CONCRETE-SUPPORTED TRACK, is the next step in rail progress

Streamlined, air conditioned, and operating on far faster schedules, today's new trains have boomed passenger business on many lines by capturing the imagination of the traveling public.

But meanwhile what of track? The brilliant record of American railroads in stepping up maintenance methods and reducing costs throughout the past 20 years does not alter the fact that many serious problems in roadbed design remain unsolved. Minor changes cannot solve these problems. One thing can—*a definitely supported* track that absorbs and spreads the load over a wider area of subgrade.

Because of this fact the spotlight is turned today on concrete-supported track. Installations of various types have served for a number of years in tunnels and terminals, and out on running track.

Will reduce trouble at soft spots

Although these installations have made good, you naturally will want to determine the merits and potentialities of supported track for yourself and in your own way. *May we make this suggestion:* Build a trial installation. Pick a troublesome section on an important line. This will give you the double opportunity of sharply reducing maintenance costs and giving the public a taste of new riding comfort. Write for booklet, *"Concrete Supported Railway Track."*

PORTLAND CEMENT ASSOCIATION

Dept. A3-27, 33 West Grand Avenue, Chicago, Illinois

A National Organization to Improve and Extend the Uses of Concrete

ADJUSTABLE, SHOCK ABSORBING,

this brace lowers switch maintenance

Two features make the Bethlehem Spring Rail Brace a maintenance-saving item on high-speed turnouts. It absorbs sudden thrusts by its spring action, thereby reducing shocks to the tie and minimizing blows to rolling stock. It can be adjusted in service at any time, with the only tool required a hammer or spike maul.

Construction is rugged. The brace itself is rolled steel and is set in and plug welded to a rolled-steel switch plate. A wedge contacts both the web and flange of the rail. A piece of heavy spring steel, welded to the wedge, transmits thrusts from rail to brace.

Shocks are absorbed by the heavy, angular spring-steel piece. Thrusts, up to 12,000 lbs., are handled by this spring before it contacts the spring-compression stop. At the same time, the stop definitely prevents the rail from moving more than 1/16 in.

Adjustment is simple. With the pawl lifted from the slot, drive the wedge parallel to the rail. As this is driven in the spring is compressed, and the brace is held firmly in place. About 1/32-in. spring compression is normal. This will hold the wedge in place. As an additional precaution, the pawl, dropped into the slot, eliminates any possibility of slippage. These slots permit a total adjustment of 1/2-in. in steps of 1/16-in.

The Bethlehem Spring Rail Brace meets A.R.E.A. standards. Punched with round holes for screw spikes or square holes for cut spikes. Installed on turnouts and cross-overs, the Bethlehem Spring Rail Brace will go a long way toward increasing safety and reducing maintenance.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

Oxweld Procedures for Rail-End Hardening Lower the Cost of Joint Maintenance

RAIL ends are practically batterproof when they have been flame hardened under Oxweld procedures. With specially designed equipment the ends of adjoining rails are given additional hardness to a degree which affords increased wear resistance at the point of impact.

The resulting reduction in the cost of rail-joint up-keep is a substantial maintenance economy and is leading many railroads to recognize that programs for laying new rail are incomplete unless the ends are flame hardened to resist batter. The track maintenance programs of many railroads include this treatment for all new rail after it is laid.

Complete Facilities

The Oxweld Railroad Service Company provides complete rail-end hardening facilities. It will pay you to investigate how Oxweld procedures for hardening rail ends can be profitably used to extend the service life of rail. The Oxweld Railroad Service Company, Unit of Union Carbide and Carbon Corporation, Carbide and Carbon Building, Chicago and New York.

OXWELD
RAILROAD SERVICE
SINCE 1912
OVER A QUARTER CENTURY OF SERVICE TO THE MAJORITY OF CLASS I RAILROADS

See the demonstration of rail-end hardening and other ways in which Oxweld helps railroads reduce maintenance costs.

Areas 35 and 36, National Railway Appliances Association Exhibit, International Amphitheatre, Chicago, March 13-16.

No. 123 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION
105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: These Changing Days

March 1, 1939.

Dear Reader:

You and I remark frequently about the rapidity with which maintenance practices are changing today; yet I wonder if you have ever checked these changes against some mile post to determine the speed with which they are occurring. I now have such an opportunity and it is a most impressive experience. It is afforded by the revision of the Railway Engineering and Maintenance Cyclopedia on which we are now working.

The last edition, of which many of you have copies, was issued in 1929 and presented an accurate record of maintenance practices of that date. Yet as we are now approaching one chapter after another, we are finding that these practices have changed so completely in the ten years that have intervened as to make almost every page of the old edition obsolete and require its complete rewriting. This is a measure of the speed with which we are changing and improving our methods. It is characteristic of our age.

And yet the changes that are now so evident in this ten-year comparison are being recorded in smaller segments in every issue of Railway Engineering and Maintenance. Scarcely an issue comes from the press that does not contain a description of some method, some material or some device that is entirely new to you. Likewise, if you compare the discussions of a subject with those of the year preceding—as, for illustration, the discussions of work equipment in this issue with those in the issue of a year ago, you will note a gradual unfolding of ideas, tending to the more complete development of improved methods and improved materials.

This is a service that Railway Engineering and Maintenance renders you—the gradual but continuous recording of developments in maintenance practices. It is a service that enables you to keep abreast of current developments, wherever they may occur—that enables you to adapt these developments to your own problems almost as soon as they appear.

Yours sincerely,

Elmer T. Howson

ETH:EW Editor.

AIRCO METHODS save money on these two MW operations

. . . WELDING UP RAIL ENDS

The AIRCO METHOD of doing this important job saves money because it employs a special oxyacetylene welding technique that cuts welding time practically in half and reduces the consumption of rod and gases as much as 40 to 50%. Contributing further to the economy of the AIRCO METHOD and the excellent results it assures, are AIRCO gases, welding equipment and AIRCO R.R. ROD—a rod specially developed for welding up battered rail ends, frogs and switch points.

. . . BUTT WELDING RAILS

In the growing practice of butt welding rails at points on the right of way where the costs of maintaining ordinary rail joints are excessive, MW men are finding that it pays to use the AIRCO Oxyacetylene Method. They are finding that this tried-and-proved method pays, not only because it saves labor and materials, but also because it invariably produces a sound, stress-free joint — a joint that will not need maintenance.

• • •

To MW department heads who would like to know more about the money-saving AIRCO METHODS of performing either or both of the above operations, AIRCO's Railroad Department will be glad to supply full details on request. And the cooperation of field engineers from this department is always available to aid customers in properly applying AIRCO METHODS.

AIR REDUCTION

SALES COMPANY

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

MARCH, 1939

Railway Engineering and Maintenance

Maintenance

How Much of a Deficiency?

THE questionnaire which the Interstate Commerce Commission sent to the railroads late in December and which they are now filling out and returning to the commission brings to the fore the question of the amount of under-maintenance of the fixed railway properties. On this question there is a wide divergence of position among railway maintenance officers.

There are those who share the views expressed by an officer of a Southern road at a recent hearing before the Interstate Commerce Commission that "there is no substantial degree of deferred maintenance." Others of equal prominence contend that there is a large accumulation of deferred maintenance and that it has progressed so far in places as to threaten safety of operation, especially under the exacting requirements of today's traffic.

What are the facts? They are not easy to determine. There is, of course, the very definite decline in expenditures for roadway maintenance from an average of $850,000,000 in the years 1925-29 to $450,000,000 in the years 1930-38. This is a decline of $400,000,000 per year, or for the nine years a total reduction of $3,600,000,000.

This is the maximum accumulation that one could suggest. Obviously, it is grossly excessive. In the first place, certain maintenance expenditures vary more or less directly with traffic and with an average decline of 30 per cent in traffic from the 1925-29 level, it is evident that the expenditure required to make good the wear and tear of this traffic has been reduced and that this amount should be deducted from any estimated accumulation based on pre-depression expenditures.

Other Offsetting Factors

Likewise, the necessities of the last 10 years have given rise to many new methods, new materials and new equipment that have greatly reduced the cost of such maintenance work as has been done, again reducing the real amount of deferred maintenance. Other deductions, equally warranted but equally indeterminate, such as those arising from the increased efficiency of the older and more experienced employees who have been retained in service, have served also to reduce the amount of deferred maintenance actually accrued during this period.

All in all, these various deductions reduce the real accumulation of deferred maintenance greatly from the maximum cited above. The difficulty arises from the inability to determine the magnitude of these deductions with any degree of accuracy. It is because of this fact that there is such wide disagreement between experienced maintenance officers over the present condition of maintenance of the properties. For this reason, it is doubtful if the returns that are being made to the commission will eliminate much of the confusion that now prevails. In fact, these returns may add to the uncertainty.

The confusion in this matter is increased by the fact that the degree of under-maintenance is not the same on any two roads but varies with the policies of individual managements and with their financial resources. The degree of under-maintenance also varies widely between main and branch lines and between main tracks and yard tracks and sidings. It varies also between various operations on the same line as, for illustration, between main track tie renewals and building painting. Because of these and other variations, there is little basis for other than an "educated estimate" on the composite figure, based on a comparison of expenditures in normal and recent years.

Some Estimates

Recognizing these uncertainties, certain students of the subject are hazarding estimates of the amount of deferred maintenance that falls within this category. Among these, R. V. Fletcher, general counsel of the Association of American Railroads, when testifying before the Finance committee of the United States Senate on December 12, stated that "for the rehabilitation of equipment and track alone, at least $600,000,000 could be spent annually for the next five years and that amount might total $775,000,000." Referring specifically to maintenance of way, he added that "the railroads in the last eight years have approximated 1,000,000 tons of new rail annually, which is about half the amount normally needed. To meet their needs of approximately 2,000,000 tons each year would cost about $100,000,000. The railroads could also well spend $90,000,000 annually for crossties and about $10,000,000 annually for ballast."

In a similar vein, Walter M. W. Splawn, member and most recent past-chairman of the Interstate Commerce Commission, stated in an address before the Bankers Club

of Chicago on January 31 that "the rehabilitation of way and equipment is more needed by some companies than others. Increase in maintenance of way would be of two kinds. First, by companies which would have to borrow some or all of the funds necessary and which could reasonably be expected to repay the loans; second, by other companies which could not make a good showing as to their ability to repay, but which must make some immediate repairs of way or else be threatened with much larger expenditures in the future."

Approaching the subject from a somewhat different angle—that of national defense, Harry A. Wheeler, president of the Railway Business Association, stated in a meeting at New York on January 25 that if war were declared tomorrow and unlimited funds were made available, "it would take not less than two years to put the railroads in shape to handle the military requirements of 1918." Continuing, Mr. Wheeler said that "operating economies during the depression years have brought many lines, especially secondary lines, to the danger point." He then recommended outright federal expenditures of $100,000,000 to $200,000,000 a year over a 10-year period for the improvement of the right-of-way and structures to the point of providing military defense requirements.

All of the above support the conclusion presented in our January issue, page 18, that "the large volume of deficiencies in maintenance that accrued during 1931 to 1935, inclusive, comprises a stern physical fact that still confronts the managements of the railroads. What this amounts to in actual figures is difficult of exact determination, but a careful study points to a sum of the order of a billion dollars."

What Railway Managements Think

Most striking evidence of all is the action of railway managements themselves when facing the prospects of increased earnings. In returns just received by the *Railway Age* from 40 of the larger railroads in answer to a questionnaire regarding their plans for maintenance of way expenditures for 1939, only 2 roads indicate smaller expenditures than last year, 12 are formulating programs of the same magnitude and 21 have programs in the making ranging from slightly up to 25 to 32 per cent larger; the average for all of the roads replying indicates an increase of 10 to 15 per cent, or $45,000,000 over the level of 1938, bringing the expenditures near those of 1937, the best year since 1930. Furthermore, the railways have already ordered, or have authorized the purchase of, more than 600,000 tons of rail for this year's laying and a sufficient number of roads are still remaining to be heard from to bring the total estimated for the year to approximately 1,000,000 tons. These figures compare with the total production of 400,000 tons last year.

These general figures are supported by a survey of the outlook of equipment purchases presented on page 142 of this issue, in which it is estimated, based on specific figures from the railroads, that they will buy more than twice as much work equipment this year as in 1938 and that these purchases will approximate those of 1937.

All this goes to show that, regardless of the opinions they may express, railway managements, when given increased earnings, will plow these earnings back into their properties immediately in the form of expenditures for maintenance and improvements. Net railway operating income is now running more than twice that of a year ago. As a result, the maintenance departments of the railways and those manufacturers who supply them with materials and equipment are facing a much more active year. In other words, there *is* a large pent-up demand for maintenance of way expenditures; and funds are now becoming available for these needs, in part at least.

Work Equipment—

Of No Value If Out of Repair

ELEMENTAL as is the importance of keeping maintenance of way work equipment in good condition in order to secure the greatest efficiency from its operation, it is probably true that, in spite of the importance attached to this matter in recent years, there is a greater proportion of equipment out of repair on the railways today than at any other time since the beginning of the depression. Many roads have reduced their equipment maintenance forces to a minimum.

This neglect of equipment has extended not alone to those units which have been idle or used less extensively because of reduced maintenance programs, with the aim of keeping down out-of-pocket expenses, but on some roads also to those units which have been worked the hardest. Where the extreme in this regard has been in effect, it is fair to assume that the reduction has been required of engineering and maintenance officers over their protests, because these men have long since learned through training and experience that work equipment, like other types of mechanism or equipment, will stand up only so long without proper attention and maintenance, with progressively decreasing efficiency in operation.

Aside from the advantages inherent in well-maintained work equipment in increased efficiency and reduced costs in carrying out routine maintenance operations, the primary basis on which most equipment is purchased, there is the important consideration of the availability of such equipment for emergency work. A shop full of equipment broken down or out of repair is of little value for line and bridge restoration work after serious damage by floods or other causes, whereas it might be of inestimable value in restoring lines to service speedily where it is readily available and in good working condition.

The value of such equipment in line rehabilitation has been evidenced during every flood that has damaged the railways in recent years, including the most recent floods in New England. In each instance, while thousands of extra men were employed to restore tracks and structures to service, the backbone of the heavy work was carried out by work equipment, rented, contracted or owned, and if it had not been for such equipment, many sections of lines would have been out for weeks and even months, with the disruption and loss of traffic and the large additional expense which would have resulted. The record of each major flood in recent years is replete with striking examples of the inestimable value of work equipment in line rehabilitation work. That of the most recent floods in New England is no exception, as is seen in the article elsewhere in this issue entitled Work Equipment in Times of Disaster. In the case of the New England floods, as in earlier floods, wherever suitable work equipment, in

good condition, was available, records of speed and low rehabilitation costs were established.

That work equipment be in good condition for emergency work is synonymous with its ready availability, because, subject as it is to difficult and particularly grueling tasks under these conditions, with no time then for proper attention and repairs, it might be just as well, and probably better, be unavailable than to break down on the job, causing delay to the work and disruption of an otherwise well organized attack. Where maintenance of way officers insist upon the proper upkeep of their equipment, it is not a question of their being out of harmony with policies of economy, but rather an indication of their interest, knowing as they do that it is not in the interest of economy in the long run to neglect their equipment.

Trends

Are They Safe Guides to the Future?

WE SPEAK glibly of trends in many fields and make them the basis for predictions of future events or, in railway maintenance, of future practices. Whether these forecasts are reliable depends on many factors, not the least of which is whether they are destined for a long term or only for the immediate future; another factor of importance is the depth and magnitude of the trends; that is, whether they are general and have developed into a steady movement, or whether they contain elements that may be subject to change.

Thirty years ago, although the trend toward the use of power machines and tools was only beginning to be apparent and was, in fact, scarcely under way, any student of intelligence and judgment could have foretold an expansion of this use, because it was based on sound economic principles. Yet he would have been a bold prophet who would have predicted the wide range of power machines and tools that are available today or the great variety of operations that have already been mechanized. In fact it was almost ten years later before the movement toward a wider use of work equipment began to show sufficient evidence of permanence for manufacturers to become interested enough to place their resources behind it and thus accelerate the trend.

If one feels an urge to predict the probable future of any particular machine, he should do so with extreme caution, remembering that not a few devices with the most promising prospects have been outmoded by changed requirements in maintenance, by the development of newer types of greater economic merit or by others having better operating characteristics.

On the other hand, one can predict with confidence an indefinite continuation of the trend toward a wider use of work equipment, that has now been in existence for three decades, that has expanded so greatly during the last two decades and that is more in evidence today than ever before. Maintenance organizations today are based on its use, so that machines have become a necessity rather than a convenience or a luxury. Furthermore, the demand for greater economy in maintenance is insistent, and it is only through the use of work equipment that these demands can be met or further economies be developed. For these reasons one can today predict not only that the trend will continue indefinitely but that the future will see a still wider use of this equipment.

The Snowstorm—

Equipment and Men Met the Test

SNOWSTORMS constitute one of the greatest threats to railway operation during the winter months; they are still a source of great concern to roadway officers charged with keeping the tracks open, especially at busy terminals. However, looking back over the experiences of the last few winters, one realizes that with the advent and widespread installation of efficient switch heaters at the throats of many of the larger passenger terminals of the country, and in some freight terminals, much of the threat of "old man winter" has been removed. It is another case of equipment coming to the aid of maintenance officers in coping with a problem that has been most difficult.

On January 30 last, at Chicago, it began to snow at about 1 a.m., and ten hours later, when the storm had subsided, 14.9 in. of snow had fallen, equalling the fourth heaviest previous snowfall on record in the city and breaking all earlier records for intensity. Highway traffic into the city was at a standstill, such street traffic as was attempted was completely demoralized, elevated train movements were slowed down or disrupted, and airports were snowbound, with all schedules cancelled—but railway trains, including the heavy commuter traffic, kept moving into and out of every terminal of the city with little delay. In fact, while 10 to 12 in. of snow had already fallen by the time of the peak morning commuter movement there were no delays at certain terminals, and a minimum at others compared with any previous performance under similar or less severe conditions.

These results were secured by throwing into the battle all of the available resources of the railways to keep their lines open. Also, well-trained, smooth-working and willing organizations went to work according to carefully prepared plans, aided by plows, power brooms, steam blowers, weed burners, and snow-melting oil, and of the greatest importance, gas, electric and oil-burning switch heaters.

As would be the case at any terminal in a severe snowstorm, it was the switches at the Chicago terminals that held the key to the success or failure of the snow-fighting efforts, and here they were afforded a large amount of automatic protection by the switch heaters which insured their operation at will and minimized the amount of cleaning necessary by hand or by other equipment. Man-power was indispensable in coping with the storm on each of the roads, and was drawn on heavily from within and without every railway organization, but where switch heaters were in service, hundreds of men were released with large savings in out-of-pocket costs, improved operating conditions, and greatly minimized hazard to the men.

The success with which the Chicago roads coped with the January 30 storm was an achievement of which they, and their maintenance forces in particular, may be justly proud. They were better prepared than ever before, and met the challenge of the storm. It was another case of foresight being better than hindsight.

Roads Will Spend 100% More for Work E

With larger rail programs and increased net earnings, the 1939 budgets of the railways for work equipment are showing marked increases in all important items. They indicate enlarged purchases of equipment already in use and expansion of this use by many roads into new fields. The total increase will be more than 100 per cent over 1938, and several times as many units of certain types will be purchased. Details of these various items are described in this article

THE railways of the United States and Canada will purchase more than 2,500 units of work equipment and 600 units other than power machines in 1939. This is more than 100 per cent more than were purchased in 1938, and is only slightly less than in 1937, the year of largest purchases since 1929. These statements are based on information obtained from representative roads that have given us information regarding the equipment they plan to purchase and have included in their budgets for this year. The magnitude of these combined budgets indicates clearly that railway officers are preparing to make more liberal expenditures this year and that, in so doing, they realize the economic value of power machines in maintenance and are prepared to mechanize their forces as rapidly as earnings permit.

It is generally recognized that the amount of rail laid in any year is a reliable index of maintenance activities as a whole for that year. Since the rail orders already placed for 1939 requirements now exceed by more than 25 per cent the *total purchases* of rail for 1938, with many orders still pending, and since railway net operating income is now larger than at any time since the beginning of 1937, it is pertinent to consider the effect of these trends on expenditures for work equipment. In the belief that this is a subject of wide interest, and that information concerning the latest trends in the use of work equipment will be useful to maintenance officers, the chief engineers and engineers maintenance of way of the larger railways were asked what units they expected to purchase during 1939.

Replies were received from 52 roads in the United States, representing 164,000 miles of line, and 2 in Canada. Of these, 34 roads reported that they have already prepared programs involving the purchase of 1,451 units of work equipment of 56 types, and 393 units other than power machines, such as rail and flange lubricators, snow-fighting and snow-melting equipment, scale-test cars, preheating ovens, cable sprayers, dolly cars, etc. Five other roads stated that they expect to purchase considerable equipment and listed 33 separate types that they have in mind, without specifying the number of each. One of the foregoing roads said that its work equipment budget for the current year amounts to $200,000.

It is of special interest that whereas 81 roads reported* that they had purchased 1,376 units of all types of equipment in 1938, only 34 roads contemplate the purchase of 1,844 units of all types during 1939. It should be noted also that these figures do not include the five roads that listed only the types they had in contemplation and that the equipment purchases planned by these roads will increase the foregoing figures materially.

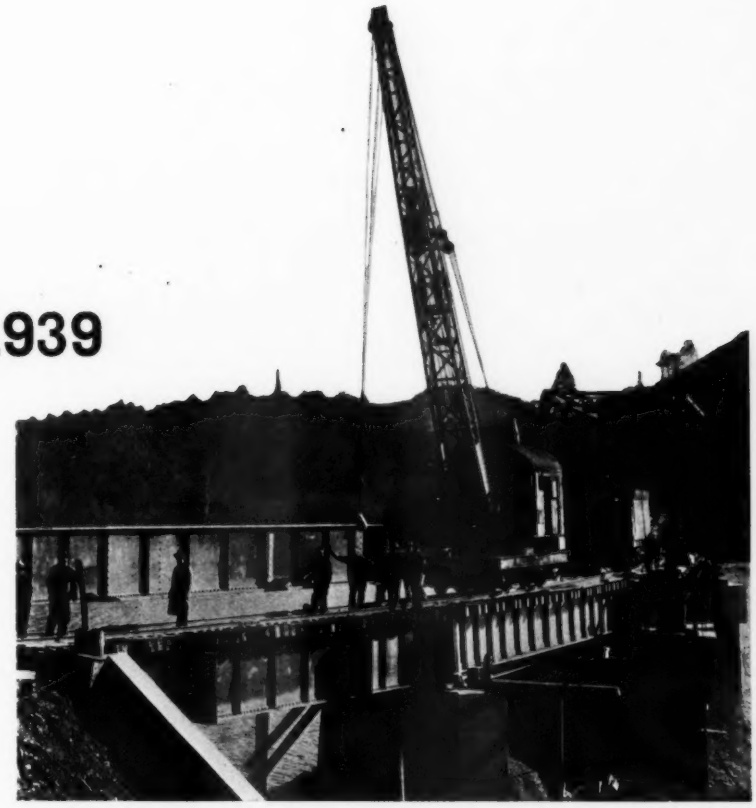
A Good Motor Car Is Essential to the Efficiency of Every Section Gang

Cover Wide Range

Of the 54 roads reporting, 9 stated that they had not yet completed their budgets although some of them expect to purchase additional units of work equipment; and 6 said that they expect to make no purchases. Of the total number of roads from which replies were received, 40 bought some units of work equipment in 1938, and

*Railway Engineering and Maintenance, January, 1939, page 20.

Equipment In 1939



Bridge Crews Would Not Get Far in Their Work Without Suitable Hoisting Equipment

14 made no such purchases during that year.

The lists of equipment included in these budgets cover a wide range of types for various maintenance operations and of sizes, from locomotive cranes, wrecking derricks and automobile trucks to paving breakers, clay diggers, wood borers and other portable tools, indicating that maintenance officers are depending more and more on power machines for the various classes of work they are called on to perform, and that they are rapidly extending the use of such equipment to new fields. Sixty-six different types of equipment were included by the 39 roads, covering their requirements for track work, ditching, grading, weed destruction, ballast cleaning, snow fighting, concrete construction, paving, steel and timber bridge maintenance, building work, handling materials and the transportation of men and materials.

In view of the enlarged rail programs for this year, it might reasonably be expected that consideration is being given to equipment for use in laying the rail and caring for it after it is laid. Confirming this assumption, more than 500 units adapted for laying and surfacing the rail and for its later maintenance will be purchased, including adzing machines, bolt tighteners, tie borers, rail cranes, rail and bonding drills, rail grinders, spike drivers, spike pullers and tie tamping outfits.

Indicating that more attention is to be given to weed destruction than in recent years, for the purpose of improving both the condition of the ballast and roadbed and the appearance of the right-of-way, more than 65 weed destroying units will be purchased. These include ballast discers and scarifiers, mowers and weed burners. They do not include, however, several mowers that are to be purchased as attachments or incidental equipment for tractors.

Although more attention has been given in recent years than formerly to drainage, the shortening of schedules of both passenger and freight trains has intensified the need for more adequate drainage to insure greater stability for the roadbed and track. For this reason, since 1936 the purchases of ditching and grading equipment have shown increases, compared with previous years, and this equipment has been used intensively on most roads. In continuation of this trend, a survey of these budgets indicates that at least 30 earth-moving units, including power shovels, draglines, ditchers and tractors, will be purchased in 1939. In addition, substantially all of the tractors will include incidental equipment, such as angledozers, bulldozers and front end loaders.

Off-Track Units Favored

For a number of years maintenance officers have been learning to appreciate more fully the greater flexibility afforded by off-track equipment that is free of the restrictions imposed by rail mounting and that can be used for work that is inaccessible to rail-mounted equipment. For this reason, there has been a marked trend toward the use of equipment of this type. More recently, this trend has been accentuated by the rising cost of work-train service, and particularly by the decisions of the railway adjustment boards requiring the employment of train-service men on rail-bound equipment that cannot be removed readily from the track. It is of interest, therefore, that all, or substantially all, of the earth moving units to be purchased in 1939 will have crawler mountings.

Modernization Continues

Cranes represent another type of equipment in which similar considerations are beginning to determine the type of mountings. Until recently the movement toward crawler mountings for cranes has been much slower than for earth-moving equipment, except for use in material yards, for elsewhere the advantages of off-track use have not always been so obvious with respect to cranes. Yet for two or three years, this trend has been plainly evident as new methods of utilizing the equipment have developed. It is of interest, therefore, that of the 25 cranes that are reported to be purchased in 1939, including 5 locomotive cranes and 20 others, ranging from 5 to 40 tons capacity, 20 will be on crawler mountings. Several of these machines will also be equipped with clamshell or dragline buckets so that they can be used for excavating as well as for handling material.

Although no road is as yet fully equipped with all of the power machines and tools that it can use to advantage, and many are poorly equipped, another trend that is easily discernible is that towards the modernization of existing equipment. Manufacturers have sometimes expressed the fear that some types of equipment were reaching the point of saturation and that the future market would be confined to the replacement of worn-out units and repair parts. That this fear is groundless as yet is evidenced by the fact that the movement toward the replacement of obsolescent units of all types can be traced in the annual purchases in recent years; yet this trend is more clearly apparent in two classes.

A Compressor and Power Spike Drivers Being Used on Rail Relay Work

The most outstanding of these is motor cars, a type of equipment that is used universally and in larger numbers than any other. For this reason, it is evident that motor cars should be nearer the so-called point of saturation than other types and should, therefore, exemplify the soundness or unsoundness of the assumption that the market will be closed to further development and new designs. Despite the fact that practically every road now has a sufficient number of motor cars to equip its regular forces, and despite the further fact that the 81 roads that reported their purchases for 1938 bought 755 motor cars during that year, more than 1,400 such cars will be purchased in 1939. That these prospective purchases indicate a definite trend toward modernization of this equipment is apparent when one considers that all but a relatively few of these cars are intended for section and inspection use.

Tie tamping equipment provides a similar illustration, for while it is not yet used universally, it is used more widely than almost any type of work equipment except motor cars. In considering this equipment, one must take into account its higher cost as compared with motor cars, wherefore there is a tendency on some roads to avoid replacing these units as long as they can be kept in operating condition, regardless of their lower efficiency as compared with more modern designs. It is of interest, therefore, that at least 250 tie tamping outfits, large and small, will be purchased in 1939, compared with 73 outfits purchased in 1938. That not a few of these outfits are being purchased for the purpose of modernization is evidenced by the fact that several roads advise that they are replacing existing equipment with new units having higher efficiency. In a few cases also, new equipment is being selected because it is lighter than that now in use. In addition to the air compressors that will be included in the tamping outfits and as a further step toward modernization, several roads are contemplating the purchase of 14 two-stage air compressors for purposes other than tie tamping, principally for the operation of small tools.

Small Power Tools

Showing that there will be a continuation of the trend toward a wider use of small power tools, which has been gaining momentum in recent years, many roads expect to purchase from one to several complete sets of portable tools for bridge and building work. Based on the information given us, it is estimated that at least 63 such sets will be purchased this year, including drills, wood borers, wrenches, saws, clay diggers, jackhammers, paving breakers, etc., although the number of individual tools will vary somewhat because not all of the sets will include all of the types mentioned. In addition to the foregoing, 12 electric generators, 20 power saws and 75 wood-boring tools will be purchased. Added to these, 10 generators will be included in the same number of electric lighting plants that are scheduled for night and emergency work.

This latter equipment provides another illustration of the fact that maintenance officers are quick to avail themselves of new equipment or improvements in existing models, provided they are convinced that it is adapted for their needs. In the past, night lighting was furnished by oil-burning torches and lanterns. Later developments included the gasoline torch and the carbide light, the latter being widely used. Efforts to introduce electric lighting were wholly unsuccessful except for installations that were to be used for a considerable time, because the generating equipment was heavy and lacked portability.

More recently, the small portable generators that are now available have brought electric lighting for emergency work into wide favor. One road reported recently that it plans to place one of these outfits on every division, with each wrecking outfit and in the outfit cars of all system bridge gangs. An officer of another road that suffered major flood damage recently said that traffic was resumed much more quickly because this form of lighting was available. As an indication of the increasing favor of this equipment, budgets already completed provide for the purchase of 10 complete lighting outfits in 1939, while 10 additional portable generator sets will be purchased to operate the portable power tools that are included in the 1939 budgets.

Highways Utilized

Another trend that can be followed through the purchases of work equipment during the last 3 or 4 years, is that towards an increasing use of the highways by railway maintenance forces. Less than 10 years ago, a committee made a report to the Roadmasters' Association on the use of motor trucks in track maintenance, in which it said that while there were some advantages in this equipment, they were not sufficient to warrant its use except in congested terminals. Despite this adverse view, the use of motor trucks has been growing, primarily out on the line as their flexibility and their economy in this service are being demonstrated. That it will continue is indicated by the fact that 60 motor trucks, 4 trailers and 2 passenger automobiles are on budgets for purchase during the year.

As one studies the purchases of former years and compares them with the items included in the budgets under discussion, he is impressed with the ever-widening use of work equipment, as is indicated by the diversity of types in use. Twenty years ago, a maintenance officer seeking mechan-

ical aids in his work would have been compelled to confine himself to motor cars, tie tampers, locomotive cranes, clamshell buckets, steam shovels, pile drivers, bridge derricks, concrete mixers, air or steam hoists and a few other semi-portable steam-driven units. In contrast, even the relatively few budgets that form the basis for this study include 66 different types for a far wider range of work than the few types that were available two decades ago were adapted for.

Shortage of Equipment

Another impressive fact disclosed by these studies is that, in addition to the variety of work that is becoming mechanized, almost all maintenance officers are keenly aware of the shortage of work equipment that exists on their own roads. In other words, the somewhat self-satisfied attitude that was apparent in some quarters as recently as four or five years ago has given way to an appreciation of the fact that only through a fuller and more intensive use of work equipment can the present demands be met for a higher standard of work at less cost.

Today few maintenance officers are reluctant to recommend the purchase of additional units or those for the replacement of worn out equipment, but they are desirous of buying to the limit of their resources, for they realize as never before that under any conditions work equipment alone leads to economy, and that under existing conditions it is impracticable to turn out the amount of work that must be accomplished without mechanical aids. For these reasons, they have shown a surprising willingness in recent years to modify their practices or to adopt new practices to enable them to utilize new types of equipment as soon as they become convinced of their advantages.

These facts should not be lost sight of in any consideration of the purchase and use of work equipment in 1939. It should not be overlooked also that while the foregoing discussion relates primarily to officers who are already experienced in the use of work equipment, there are many roads that as yet have no such equipment except motor cars, and that not-a few of them are now beginning to realize that they must mechanize their forces or reduce their maintenance to a lower level. For this reason it may be expected that some additional roads will begin to use power machines other than motor cars for the first time this year and that a number of others will do so in the near future.

Not all of the types of equipment included in the budgets for 1939 have been mentioned, for the list is too long and the range of work for which they are intended is too great to permit a discussion of all of them. Among the important types that were included, some of which will be purchased in considerable quantities, are concrete mixing and placing equipment, gasoline and Diesel engines to replace those on equipment now in service, steam pile hammers, lag-screw setters, tie cutters, paint spraying outfits, portable and stationary centrifugal pumps, road graders, rail and flange lubricators, snow plows, electric welding outfits, dolly cars, dump cars, tie framing machines, etc.

It is evident that other trends and a continuation of well-established practices can be traced through a study of these budgets. Enough have been cited, however, to show that the use of work equipment is still expanding, not only into new fields, but into fields where it is already established, and that the cycle of replacement of not a few types is well under way. It is equally evident from the range of types included in the budgets that maintenance officers are willing to buy to the limit of their resources and ready to adapt their plans and practices as may be necessary to utilize new types as soon as they are convinced of their value.

Extensive Yard Installation of Electric Switch Heaters

IN connection with the recent complete modernization of the extensive Clearing yard of the Belt Railway of Chicago, this yard has been equipped with a large number of electric switch heaters, comprising one of the largest installations of its kind in the country. Altogether, a total of 77 crossover, lap and yard lead switches have been equipped, involving the installation of 154 electric switch heater units.

The new electric heaters are of the tubular type and involve a single heating unit 16 ft. long. One of these units is installed directly beneath the head of each stock rail, where it is fastened to the web of the rail with special clamps and cadmium-plated bolts and grooved lock nuts. Each unit consists essentially of a straight nickel-silver tube housing a coiled nickel-chrome wire centered in magnesium oxide. All units extend from a point approximately 2½ ft. in advance of the switch points, through the distance in which the switch rails make contact with the stock rails, to within 3 ft. of the heel of the switch.

Of the 154 electric heating units involved in the installation, the General Electric Company supplied 136 and the Westinghouse Electric & Manufacturing Company supplied 18. The General Electric units, known as Calrod heating units, have an effective heating length of 14 ft., with a 1-ft. non-effective section at each end. The effective heating element is rated uniformly to give each heating unit a rating of 3,000 watts.

The Westinghouse switch heaters installed, known as Corox heating units, are also 16 ft. in length, but have an effective heating section 15 ft. long, with ½-ft. non-effective sections at each end. The effective heating section is rated at 300 watts per foot for 7 ft. and at 125 watts per foot for 8 ft., giving a total rating of 3,100 wats.

Showing One of the Switches Equipped With Electric Heaters After the Heavy Snow Storm on January 30

Power for the operation of the new electric switch heater installation is obtained from either or both of two steam-driven generators in the yard power house, which also furnish the necessary power for all other electrical facilities at Clearing yard.

Work Equipment-

All Available Power Jacks Were Pressed Into Active Service During the Emergency

LAST September, following a flood and hurricane of unprecedented proportions, the railroads in New England were confronted with the task of restoring to service in a minimum of time hundreds of miles of severely-damaged lines, much of which had all but been destroyed as a result of track and bridge washouts. In coping with the emergency, the railroads brought into action every available unit of work equipment applicable to the restoration work, and largely as the result of the availability and intensive use of much of this equipment they were able to restore train service after relatively brief interruptions, considering the character and extent of damage necessary to repair.

Nature of the Disaster

The New England disaster, it will be recalled, was the outcome of a combined attack by torrential rains and a hurricane of tropical intensity, the first ever known to strike this region. Late in September, as a result of more than a week of incessant rainfall, many streams rose to flood stages—in some instances to unprecedented heights—with the result that the flooding and destruction of tracks, bridges and other railroad property was extensive and widespread. Then, on September 21, the hurricane struck and added immeasurably to the havoc by blowing down communication lines and buildings, by covering the tracks with debris of every description and by piling up a tidal wave that engulfed shore properties all along the New England coast. Among the railroads the principal sufferer, as a result of the tidal wave, was the New York, New Haven & Hartford on whose double-track Shore Line the wave washed out or damaged numerous bridges and literally effaced many miles of track.

While none of the railroads serving New England was spared, the brunt of the damage was borne by the Boston & Maine and the New Haven,* not only because they have the greatest mileages of lines in the area but also because in each case these roads had properties that were exposed to particularly destructive phases of the disaster—namely, the tidal wave on the New Haven and the highly turbulent Millers river on the B. & M. As a measure of the character and extent of the damage incurred by these railroads, it may be mentioned that on the B. & M. alone damage of a major character was suffered at more than 300 separate locations, including 266 major washouts, 22 landslides, 45 submerged locations, and 27 bridges either destroyed altogether or severely damaged. On the New Haven the situation with which the company was confronted on the morning of September 22, involved washouts at more than 250 separate locations, 21 slides, and damage of varying degrees up to complete destruction to 43 bridges. About 17 miles of tracks were washed out altogether, although a total of 75 miles of tracks were affected in some degree by the flood waters.

Power Units Prove Vital

As mentioned at the outset, maintenance of way work equipment played a vital, if not indispensible, part in the restoration operations, and maintenance officers in the affected area are unimously of the opinion that, in the absence of such equipment, the resumption of train service would in many instances have been substantially delayed. During the emergency there was a demand for practically all types of equipment used in the maintenance of tracks and bridges, and with respect to certain types the demand was such as to require that all available units be brought into service. Indeed, in some instances sufficient railroad-owned equipment was not available to meet the demand and in-so-far as such equipment could be obtained locally from contractors or other railroads it was rented or borrowed. However, since there was also an extensive demand for construction equipment for rehabili-

*The damage inflicted on both of these carriers was described in detail in the November, 1938, issue.

In Times of Disaster

In making emergency repairs to their tracks and structures following the flood and hurricane of last September, the New England railways utilized work equipment extensively in a wide variety of ways. This article lists various types of equipment that were found valuable during the emergency and describes how they were used to the best advantage to expedite the restoration of tracks and structures

tation purposes on the part of other agencies in the afflicted area, such equipment could not always be obtained readily.

Among the types of equipment that were utilized extensively and intensively during the emergency may be included cranes, shovels and ditchers of all types, both track and crawler-mounted; pile-driving equipment; spreaders; power track jacks; tie-tamper outfits; portable woodworking tools, such as saws and drills; compressors; portable generating outfits for operating tools and for flood-lighting purposes; crawler-mounted bulldozers; track motor cars and highway motor trucks. For the purpose of illustrating the manner in which these types of equipment were utilized the remainder of this article is based on the experiences and practices of the B. & M. and the New Haven.

Material-Handling Equipment

Because of the tremendous quantities of material that had to be handled during the emergency in filling washouts, removing slides from the tracks, and in handling rip rap, it was to be expected that all types of material-handling units, such as cranes, ditchers, shovels, and spreaders, would come in for extensive use. Indicative of the extent to which equipment of this type was used is the fact that during the height of the emergency the B. & M. alone had in service nearly 40 units of railroad-owned equipment of this general class, including 3 power shovels, 15 gasoline-powered and 8 steam-powered locomotive cranes, 5 ditchers, 1 crawler crane, and 5 spreaders. This equipment, moreover, was supplemented by 6 gasoline shovels and 1 steam track-mounted shovel obtained from contractors, and 1 steam crane borrowed from the Maine Central, the latter unit being used principally for driving piles. A spreader was also borrowed from the Maine Central.

The New Haven had in service a similarly large number of material-handling units and here again it was necessary to engage a considerable number of machines from contractors. Among the latter may be mentioned a clam-shell bucket mounted on a motor truck, which was utilized for removing debris from tracks on the Shore Line at a location that was inaccessible to track-bound equipment. Moreover, on both the New Haven and the B. & M., it was necessary to enlist the aid of contractors at many locations, who had in operation a considerable amount of additional equipment.

Pile Drivers Widely Used

Because of the large number of bridge washouts and the consequent necessity of constructing temporary pile trestles and providing pile-bent supports for weakened steel spans in numerous locations, pile-driving equipment was widely used. Not only did this phase of the operations involve the use of standard pile-driving equipment, but in numerous instances the work was performed with steam hammers hung from the

Right—Generators Were Used Widely for Flood-Lighting Purposes. Below—Compressors Were Found Invaluable in the Bridge Repair Work

Work on This Temporary Trestle on the B. & M. Was Expedited by Utilizing Cranes for Handling Material at Both Ends

booms of cranes. In the latter connection it was noted that satisfactory results could be obtained without the use of leads.

In the pile-driving operations, particularly advantageous use was made of crawler-mounted cranes equipped with steam hammers. A number of bridge washouts on the Fitchburg division of the B. & M. and on the Shore Line of the New Haven were inaccessible by rail and the adaptation of crawler equipment for driving piles at these locations permitted the bridge work to proceed in advance of the restoration of tracks to the bridge sites. On the Shore Line of the New Haven the use of a contractor-owned crawler-mounted pile-driving outfit for driving temporary supporting bents for a steel span near Lords Point, Conn., enabled work to proceed on this structure long before it could have been reached by track-bound equipment.

In a somewhat similar instance on the B. & M., crawler equipment was used for driving a pile trestle at a bridge washout at Wendell, Mass. Here a work train was able to reach the bridge site from the east, but to expedite the work it was desired to build a trestle from the west simultaneously with the placing of a fill from the east. To this end a crawler-mounted crane equipped with a steam hammer was transported by highway trailer to the west end of the washout, steam for the hammer being supplied by a boiler obtained from a contractor.

Bulldozers Prove Versatile

Crawler-mounted equipment in other forms also proved to be a valuable adjunct to the restoration operations. This was particularly true in regard to crawler-mounted bulldozers which were adapted to a multitude of tasks, some of them being of an unsuspected nature that were developed under the stimulus of the emergency. For instance, on the B. & M. it was found that bulldozers could be used to push material under the tracks at washouts, thereby making unnecessary the more costly expedient of installing cribbing. Other tasks to which bulldozers were adapted during the emergency included the removal of slide material from tracks, the building of roadbed, the spreading of fill material and rip rap, and the cutting down of approaches to washouts to permit the laying of tracks on ramp grades.

An example of the latter application is embodied in the experience of the B. & M. at a washout 1,400 ft. long (the longest on the railroad) at Millers Falls, Mass. Here a bulldozer mounted on a Model 50 tractor was able to fill the washout for a distance of 400 ft. at one end, and later rendered valuable service by spreading material placed by dump trucks. At one location on the New Haven where a track along the coast had been carried off the roadbed and covered with debris, a bulldozer was used to good advantage in uncovering the track and rebuilding the roadbed for a distance of ¾ mile. Later the tractor carrying the bulldozer was used to pull the track back into line. Because of the highly important role assumed by bulldozers during the restoration operations, company-owned equipment was supplemented by numerous additional units, some of which were used on a rental basis while others were operated by contractors.

Portable Power Tools

Because of the large amount of pile-trestle work involved in the restoration operations (the B. & M. alone built about 1,500 ft. of pile trestle), portable power tools applicable to this class of work came in for intensive use, and were an important factor in speeding up the operations. As was to be expected, equipment applicable to timber-framing operations, such as power saws and wood augers, both electrically and pneumatically operated, proved particularly valuable. Illustrative of the extent to which such equipment was utilized is the fact that the New Haven, on which each bridge gang is supplied with a full complement of power tools and a portable generator, augmented four local bridge gangs on the Shore Line with eleven such gangs from other parts of the system.

Portable wood-working tools were also used extensively on the B. & M. where the bridge gangs are likewise liberally supplied with power equipment of this nature. At one location on this road where a temporary trestle was constructed involving both pile and frame bents, the railroad established a temporary wood mill embodying a variety of pneumatically-operated equipment, including two hand saws, two portable circle saws, four wood-boring machines, one drill and one nut runner.

Since the emergency repair work went forward at many locations on

The Construction of This Temporary Trestle on the B. & M. Involved the Use of Two Locomotive Cranes, a Crawler Crane (in Bed of Stream) and a Land Pile Driver

a 24-hr. basis, adequate illumination for night operation was essential to efficient prosecution of the work. For furnishing power for such illumination portable electric generators were widely used, including tie-tamper generators as well as the smaller units used by bridge and building gangs. So great was the demand for generators for this purpose that in some instances it was necessary to supplement railroad equipment with units rented from contractors and other agencies.

The B. & M. had a total of 12 generators in service for lighting purposes, including four tie-tamper units, the remainder being smaller units of the type used by bridge and building gangs. Typical of the manner in which generators were used on this road for lighting purposes is the installation that was set up at the bridge location mentioned above in connection with the use of portable power tools. Here the lighting installation included three generators—one tie-tamper unit and three smaller sets—having a total capacity of 4,000 watts. Extensive use was also made of generators for lighting purposes on the New Haven. To meet the demand for power for flood-lighting purposes on this company's Shore Line, the generators assigned to bridge gangs were supplemented by all available tie-tamper generators, of which the company has nine.

On this road the use of generators for lighting purposes was also extended to buildings at locations where power failures occurred. For instance, a small building at New London, Conn., was lighted by a portable generator of the type used by bridge gangs. Further, fearing that the tide would rise sufficiently at New Haven to cause a power failure in its station at that point, this company arranged three tie-tamper generators on a baggage truck on the station platform to serve as a standby source of power for the station. Fortunately, however, the anticipated power failure did not occur and it was not necessary to bring these generators into use.

Air compressors found wide use during the emergency in a diversified list of applications. On the B. & M., bridge gangs are equipped with compressors for operating portable tools, and these, of course, were put to intensive use. In addition this company had 30 of its 34 tie-tamper compressors in use for different purposes as well as for tie-tamping operations. Some of these were utilized for furnishing air for the operation of air dump cars and spreaders, while still others were used for operating pneumatic drills in blasting operations.

Dump Trucks Were Used Extensively on the New Haven for Handling Filling Materials

Power Jacks in Wide Use

Because of the large amount of trackage that was involved in the emergency, power track jacks were in great demand and one maintenance officer was heard to remark that in such an emergency "one power jack is worth 30 men." On the New Haven all of the company's four power jacks were in service, three of them on the Shore Line. Likewise the B. & M. had all of its five power jacks in intensive service, and in addition this company borrowed two such jacks from the Maine Central, and obtained a combination power track jack and shifter from a contractor. At one time this company had four power jacks in service at a single location, namely, at the big washout at Millers Falls.

In addition to jacks, other types of power track equipment also found wide application during the emergency, including tie-tamper outfits, rail drills, bonding drills, and nut runners. Mention should also be made of the fact that practically every available track motor car was pressed into service during the emergency, either for inspection purposes or for the transportation of men and materials.

Motor Trucks

Because of the impassable condition of the tracks at many locations, and also because tracks in service were frequently occupied by work trains, highway motor trucks proved exceedingly valuable as an agency for the transportation of men, materials and equipment. The New Haven maintenance organization utilizes highway trucks extensively for the routine transportation of men and materials and, after their experiences during the emergency, maintenance officers of this company have stated that these trucks proved to be indispensable in expediting the restoration work. This company feels that it was exceedingly fortunate in having available a relatively large number of trucks of its own, since, owing to the demands for such equipment on the part of other agencies throughout the flood area, it would have been difficult, if not impossible, to obtain the required

(Continued on page 153)

Driving Piles With a Crawler Crane Equipped With a Steam Hammer on the New Haven

A Tie-Tamping Gun Being Repaired at the Newburgh, N. Y., Repair Point

New York Central Localizes

By EARL H. MILLS

General Gas Engine Inspector, New York Central, Lines East

UNDER present economic conditions every large railroad must use and maintain a large number of work equipment units to get the maximum return from each dollar appropriated for the construction and maintenance of roadway and structures. This equipment represents a considerable investment and is of wide variety, ranging from small self-contained gasoline-engine powered units that can be moved by one or two men, to machines weighing many tons, such as cranes and shovels. These units, scattered over many miles of roadway, constitute in themselves a very serious problem of maintenance and management if their potential ability to do work is to be utilized to the utmost. Some idea of this problem as it exists on the New York Central may be gained when it is considered that on the Lines East alone, there are approximately 1,760 units of work equipment to be maintained.

Repairing work equipment takes on two phases, that done in the field and that done in the shop. On many roads the problem of repairs is handled by extablishing a well-equipped central shop and sending to it the various machines either as the need arises or on a regular schedule and in off-season periods when they are not in use. With this system, only minor adjustments are made in the field, mostly by machine operators. This concentration of work has many advantages from the standpoint of assuring high-quality workmanship at moderate charges for the actual work done. The work can be divided and specialized, mechanics reach a high degree of skill, no time is lost in traveling, special tools are available, parts stocks are complete, and there is good inspection and close supervision.

In fact, from the viewpoint of the shop man, the central-shop scheme comprises an ideal set-up. However, when other factors are given consideration, such as those involved in assuring adequate field repairs, the matter can be viewed in a different light and not a few maintenance officers feel that a somewhat different set-up, based on the policy of localizing responsibility for all repairs, results in lower repair costs and a greater output of work per machine.

Assign Responsibility

Machines are bought for use and getting the greatest amount of work from them at the lowest cost is the problem of some individual who has little interest in repair work other than to know that it is done quickly and without taking too much productive time. It is a relatively simple matter for skilled shop forces to take a broken-down machine and turn it out in good order, thoroughly tested and ready to work. It is not so simple for a supervisor or his foreman to take a machine in perfect repair, select and train a man to run it and then get the full value of its built-in ability to do certain work for a long period.

To accomplish this end the machine must be under the supervision of an individual who alone is responsible for the condition of that machine at all times, who is familiar with its peculiarities and who is available for making repairs on short notice. The best machines have minor breakdowns and require occasional adjustment. Regular operators may be absent and new men must be broken in for the work. Makeshift repairs result in costly delays and interruptions to the work.

Repairs Made Locally

On the New York Central careful consideration of the matter led to the conclusion that the problem of assuring that maintenance work equipment would be maintained adequately, economically and efficiently could best be solved by placing the responsibility for its upkeep entirely in the hands of local forces. A contributing factor in this decision was the belief that, when subjected to the proper care and mechanical supervision, work equipment need not be overhauled periodically, a practice that is associated almost invariably with the policy of making repairs in a system shop. It is believed that the periodic overhauling of equipment often results in a tendency for the shop forces to carry out considerable unnecessary repair work.

In accordance with the foregoing basic conceptions, the responsibility for the upkeep of work equipment is placed almost entirely on the local organization to which it is assigned. The actual work of making the repairs, regardless of their character and extent, is done by local mechanics or maintainers. As a rule, one of these mechanics is assigned to each track supervisor's district, al-

(Lines East)

Equipment Repairs

On the New York Central, Lines East, responsibility for the upkeep and repair of work equipment rests almost altogether on local maintainers reporting to the supervisors. In this article, Mr. Mills describes this system and tells why he considers it to be an effective and economical method of maintaining work equipment in a safe and efficient operating condition

Testing a Magneto at the Repair Point at Beacon, N. Y.

though in a few instances they report to the supervisor of bridges and buildings. Generally speaking, these employees, each of whom is usually assisted by a helper or an apprentice, are responsible for the condition of all work equipment on their respective subdivisions, regardless of whether it is regularly or temporarily assigned to the territory.

With the exception of motor cars, which are inspected monthly, the maintainers are not expected to make periodic inspections of the equipment on their respective territories, but they are expected at all times to have an intimate knowledge of the condition of each unit. They are available for the making of running or emergency repairs to equipment, and assist in the selection and training of operators. When any operation is in progress that involves a large concentration of machines, such as rail laying, the maintainer is expected to be on hand to supervise the operation of the different units and to insure that delays occasioned by breakdowns will be reduced to a minimum.

Other Duties

During the working season the maintainers move about over their respective territories from machine to machine for the purpose of making any necessary adjustments or repairs and to determine if the machines are receiving the proper attention on the part of the operators. For making general and heavy repairs to work equipment, each mechanic maintains what is referred to as a repair point, where he has a small shop with the necessary equipment and tools. During the winter months the mechanic and his helper or apprentice spend much of their time at the repair point, making any repairs to equipment that may be necessary to get it into good working order for the next seasons' operations. At several locations the repair facilities of a number of subdivisions are grouped in a single shop and in such instances it is economical, because of the larger volume of work to be done, to equip the shops with a greater variety of machine tools and other devices than is usually found at the smaller repair points.

Except for small items the mechanics do not carry stocks of spare parts, but very complete stocks of this type are maintained by the stores department and each mechanic has a general knowledge of the parts carried by that department. Requisitions for any such parts that may be needed by the mechanic are submitted by the supervisor. In case of emergency when the part needed is not immediately available through the stores department the supervisor may obtain authority to buy it locally or to order it direct from the manufacturer.

As mentioned previously, practically all types of work equipment used by the maintenance department are repaired by the local mechanics. There are, however, certain exceptions to this general statement. For instance, while the local mechanics make minor or running repairs to M.C.B. equipment, heavy repairs to such units are made by the mechanical department at the West Albany shops (for the Lines East). Moreover, responsibility for the repair of electrical equipment, such as generators and motors, rests with the division electrician rather than with the local mechanic.

Repairing Ballast Cleaners

Another type of equipment that is accorded special treatment is the Mole ballast cleaner. General repairs to machines of this type are ordinarily made at either Fonda, N.Y., or Beacon, where the shop facilities are somewhat more extensive than at most of the repair points. However, the primary reason for this policy in regard to ballast cleaners is that the mechanics at both Fonda and Beacon have had extended experience with such machines and are more proficient in making repairs to them. As a matter of fact one of the mechanics at Fonda (there are two at this location) devotes practically all his time during the winter months to the repair of this type of equipment.

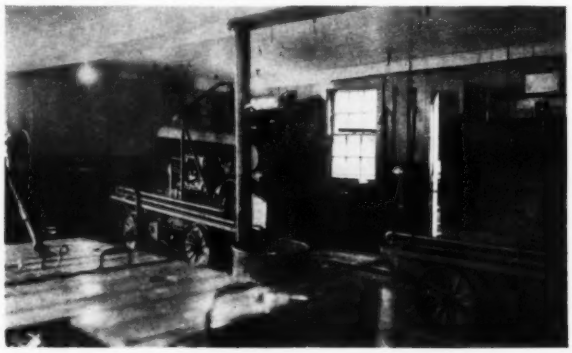
To achieve the proper degree of co-ordination between the efforts of the local mechanics on the Lines East, general supervision over the operation and upkeep of work equipment is centered in the writer who is

attached to the office of the engineer maintenance of way. While no direct jurisdiction is exercised over the assignment and operation of the equipment, close touch is maintained with its condition and recommendations are made from time to time concerning methods of its operation and its upkeep.

The mechanics are kept advised of new practices and standards pertaining to their work, and an effort is made to contact each of them personally at least once every two or three months. Advantage is also taken of the opportunity afforded by these trips to contact the supervisors and the division engineers for the purpose of assisting them with any problems pertaining to the operation and upkeep of equipment.

As a means of keeping in touch with the condition of work equipment in general and to insure that it is being maintained to the proper standards, an effort is made to inspect each piece of equipment at least once each year, this inspection being made by the writer in the company of the respective mechanics. Periodical reports on performance, mileage and other factors are also employed as a medium for keeping in close touch with conditions as they develop in the field.

Each mechanic is furnished with manufacturer's instruction books covering the various types of equipment under his care. As a supplement to these books special mimeographed instructions have been issued for the information of the mechanic, the supervisor and the operator. For convenience these instructions are compiled in loose-leaf form and are kept in the office of the supervisor of track. They show, for each machine, the various pieces of accessory equipment that should accompany that machine and embody special instructions pertaining to its operation and upkeep. Contained in the same folder are instructions giving the proper lubricant for use with each unit of work equipment. By keeping these instructions in loose-leaf form, it is possible to substitute revised sheets readily or to add new sheets made necessary by the acquisition of new types of equipment.



Interior View of the Repair Facilities at Beacon, N. Y.

Has Proved Satisfactory

The system of maintaining work equipment described above has produced thoroughly satisfactory results on the New York Central. The maintainers live with the machines and their operators and know the peculiarities of each. Operators and new men receive help and instruction when most needed. The morale and confidence of operators are excellent and any tendency to make excuses for poor performance is eliminated when it is known that a skilled man is checking up. Small breakdowns are quickly and permanently corrected and machines are in use a maximum percentage of the total time available. Gang delays are costly and much of the economy of a central shop can easily be offset by roadway gang losses where local repairmen are not at hand.

Certain other advantages inherent in the policy of localizing equipment repairs can also be noted. Defective machines are not continued in operation in the hope that they will last until seasonal work is over, when they then can be sent to the central shop for repairs. Moreover, with experienced mechanics available locally, it is not necessary to send machines long distances for repairs, thereby eliminating the loss of productive time that would be entailed in shipping the machines to a central shop.

Modern machinery is built to very close limits of fit, with interchangeable parts, and has long life if it is properly used and is treated with intelligent care. Interchangeable parts, as an outgrowth of the automotive industry, can be installed without extensive shop equipment. Small servicing tools, such as wheel pullers, chain hoists, torches, specialized hand tools, etc., are relatively inexpensive and can be used in any small building that will serve as a shelter. Repair parts can be sent to the machine much easier than sending the machine to the repair parts. With regard to certain more expensive units of equipment that are used only occasionally, such, for instance, as Flometers, one unit can be made to serve the requirements of a large district by routing it from point to point as required.

A View at the Beacon, N. Y., Yard, Showing Various Units of Work Equipment That Have Either Been Repaired or Are Awaiting Repairs

Uses Outside Shops

Much specialized work can be accomplished economically by having it done by outside automotive shops rather than by railroad forces. Mag-

netos and other ignition units, carburetors, governors, and starters are easily removed and replaced. Outside shops with the necessary specialized tools for testing, repair and adjustment are established in many cities, and smaller communities have exchange services on such items that insure good work at reasonable prices. Stock room forces receive the defective unit, arrange for the exchange and the local mechanic performs the removal and installation.

Special Parts in Stock

Wooden parts of complicated construction are bought from the original manufacturer of the equipment, are carried in stock and are installed as needed more economically than having such parts made by ordinary carpenters. The volume of this work on most railroads is not great enough to warrant training special men to do it and furnishing them with the necessary templates and gigs for making these parts with the desired accuracy. By maintaining adequate, carefully selected stocks of repair parts at storekeeping points, the time required in getting parts to the scattered repairmen seldom results in excessive delays in making the necessary repairs.

Shop Work Scheduled

Large units of equipment, particularly those under M.C.B. classifications, must of necessity be shopped for heavy repairs. Existing motive power or car department shops have the necessary facilities for doing this and, as pointed out previously, are utilized for this purpose on the New York Central. However, to insure that the shop mechanics will not be inclined to undertake unnecessary work on these machines, they are accompanied when sent to the shop by a schedule of the work that is to be done on them, this schedule being generally based on a careful inspection made by the writer, or by a competent person designated by him.

Specific Examples

Authentic records are available of machines working long periods under the system on the New York Central without major repairs. One large drag line has been in service eight years without major repairs and has never been out of service for any cause more than six days. Large tie-tamping air compressors have been in use 10 years without a piston removal or bearing adjustment for a total of approximately 7,000 hr. One motor car was used 11 years on the same section by the same foreman, being operated a total of 35,000 miles with only minor repairs.

Working on a Compressor at the Repair Point at Newburgh, N. Y.

Instances where motor cars have been operated three and four years and tie-tamping compressors two and three years without extensive service work are common. Nut runners, tie borers, rail grinders and several other types of small units of equipment assigned to certain territories remain there and with care, planning for their repair in conjunction with the work to be performed, are always ready when needed.

It is only to be expected that any system for maintaining work equipment will develop weakness that must be corrected, and that in use on the New York Central, Lines East, has proved to be no exception in this respect. However, the few weaknesses that have manifested themselves have been readily corrected, generally through the agency of more intensive supervision. Thus, our experience has demonstrated that the policy of localizing equipment repairs, considering all aspects of the matter, has proved altogether satisfactory and economical.

Work Equipment In Times of Disaster

(Continued from page 149)

number of units from other sources.

Not only were the trucks used extensively for the transportation of men and materials but they were also utilized widely for hauling such equipment as portable generating outfits, flood-lighting equipment, compressors, tie-tamping tools, hand tools of all descriptions, and power tools such as saws and drills. They also proved valuable for the transportation of food and other supplies to track and bridge gangs working at isolated locations.

An application in which trucks proved of particular value on the New Haven was the transportation of bridge gangs and materials for the cribbing up of washouts preparatory to the dumping of stone or gravel by work trains. At many such locations ties for cribbing purposes were transported to a nearby crossing by truck and thence by push car; they were also hauled in by truck, to the scene of the washout. In this manner it was possible to proceed with cribbing operations at isolated locations considerably in advance of the arrival of work trains, and thereby to expedite the repair work materially. The use of trucks on the New Haven was not confined to company-owned equipment. Many such units, particularly of the dump type, were utilized by contractors who participated in the repair operations at various points.

Motor Trucks Valuable

Motor trucks were also utilized extensively on the B. & M. where, in addition to the transportation of men, materials and smaller pieces of equipment, they were used frequently for hauling larger units such as steam hammers, power track jacks and bulldozers. This company had about twenty trucks of its own in use, which were supplemented by a considerable number, also largely of the dump type, that were rented from contractors. Still others were operated directly by contractors.

The foregoing is by no means intended as a complete record of the number and types of work equipment that were utilized by the two railroads in restoring their tracks and structures to service following the disaster. Rather it is designed simply to bring out the various ways in which such equipment was used to expedite the repair operations and thereby to limit disruptions in train service to a minimum.

Frisco Modernizes

Left—Motor Cars Awaiting Minor Repairs. Motor Car Shop in Background. Below—Modernized Car Ready for Shipment

THROUGH an expenditure of $113,000, the St. Louis-San Francisco has in three years, practically converted its typical stock of obsolete motor cars into a modern installation. Starting on September 15, 1935, with several hundred obsolete cars and with only a few others that were in good condition, this road revised its organization and methods for maintaining its motor cars and other units of work equipment. During the three years that this campaign of modernization has been under way, many of the obsolete units have been retired, others have been modernized and much new equipment, including particularly new engines, has been purchased. The result of this campaign is that today the motor cars and roadway machines on this road are not only modern, and in better condition than ever before but are being operated at much lower cost, and are prepared for any service for which they were designed.

Furthermore, as a result of the better methods that have been developed through experience, the cost of repairing and modernizing the various classes of equipment, particularly the motor cars, has declined steadily and despite the fact that more cars passed through the shop in 1938 than in 1936, the first full year for the present plan, a reduction of 11 per cent was made in shop costs. This reduction is all the more striking because certain accessories that were omitted during the first year are now being applied to all cars passing through the shop.

Likewise, because the cars in service are in better condition and because considerable educational work relating to the handling of the cars has been carried on, the cost of their operation on the line has shown a still greater relative decline. Again, although the number of cars in service has been reduced by 149 there has been no shortage in almost two years, a situation that sometimes became acute under the former system.

The Former Systems

Prior to 1926, the organization for maintaining work equipment consisted of a gasoline-engine supervisor, in charge, a traveling supervisor of maintainers, 11 maintainers, a shop force and 1 clerk. Ten of the maintainers were assigned to divisional work and one to the entire system. The entire personnel reported to the gasoline engine supervisor, except the shop force, which reported to the superintendent of reclamation.

This system was modified in 1926. During the period from 1926 to September 15, 1935, the department was under the direction of the superintendent of motive power. The gasoline-engine supervisor and a supporting staff of three maintainers were retained until January, 1931. However, the shop force remained under the direction of the superintendent of reclamation.

Although the practice of furnishing relief engines and cars originated during 1926, it was not followed extensively, but only occasionally as an aid to the maintainers on the line of road. The actual inauguration of the present system occurred between September 15, 1935 and January 1, 1936, by which date results began to indicate clearly its value, through savings in man hours because of better conditioned units, as well as through reduction in the maintenance and operation of the equipment.

Among the results of the first com-

Its Work Equipment

Starting in 1935 with several hundred obsolete motor cars and many others that were seriously in need of major repairs, the St. Louis-San Francisco has carried out a campaign of modernization that in three years has brought this equipment to a high stage of efficiency. In this campaign 229 cars have been retired and 80 cars have been purchased, while the remaining cars have either been fitted with new engines or the engines have been rebored and fitted with oversize pistons and rings, and new bearings. A most interesting fact in connection with this campaign, which is described in this article, is that motor car repairs are now costing $74,000 less a year than formerly

plete year, 1936, under the present organization, was a reduced expenditure of $29,000, compared with the expenditures of the previous year. Another reduction of $6,000, was made in 1937 and a still further reduction of $5,000, was made in 1938. The Frisco is now maintaining this equipment for $40,000 a year less than it cost during the period from 1926 to January 1, 1936, and at an expenditure of $74,000 a year less than under the system in effect prior to 1926.

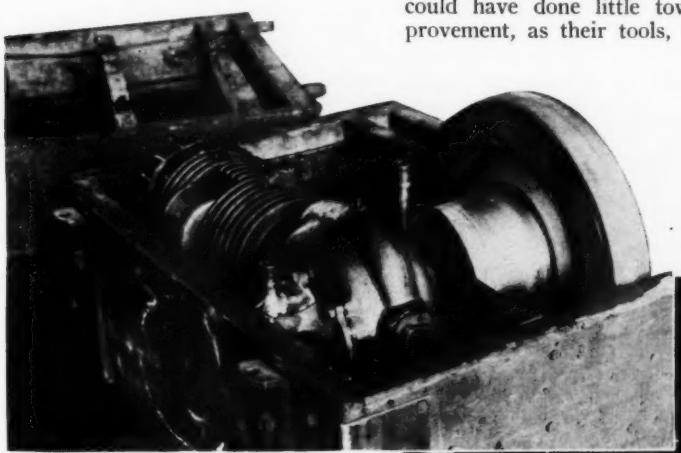
Faults With Old System

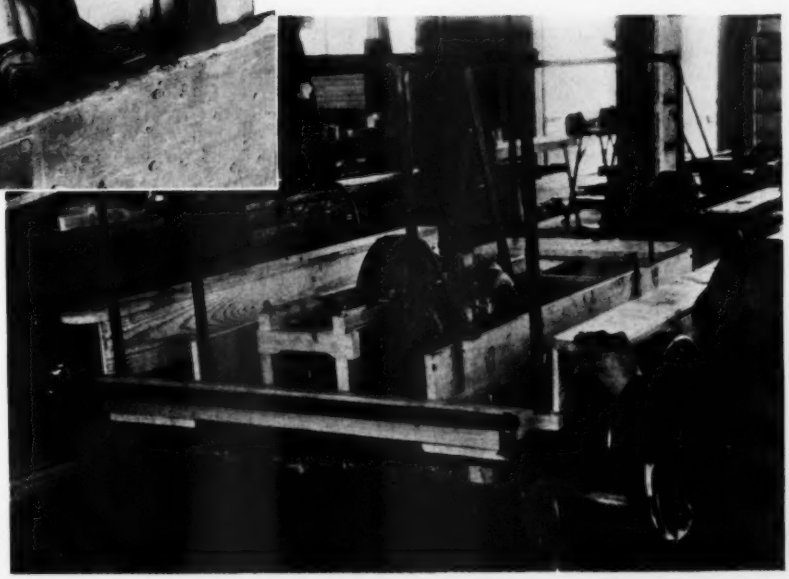
Under the present system the personnel of the department consists of the foreman of work-equipment maintenance and the shop force. Under either of the former maintainer systems, the condition of the motor cars as a whole became progressively worse until the situation reached the point where a change in practice became necessary. This is not intended as a criticism of either the field men, or of the supervision under those systems, for the testimony is general that both were doing the best possible under the circumstances.

Primarily, the trouble that was being experienced arose from defects in a system that had its origin when the amount of equipment in service was small and that had developed as a natural process along its original lines as the number of units increased. The principal trouble was that there was little co-ordination between the two departments with respect to repairing the equipment and supervising its operation.

In other words, when a unit was sent into the shop certain repairs were specified. When these had been made the responsibility of the shop ceased, for it had no means for following the car or machine into the field to study its operation or gather information concerning its efficiency, its adequacy for the service to which it was assigned or the care or lack of care that it received while in service. This department was not in a position, therefore, to suggest policies of retirement, replacement or modernization; or those relating to the care and operation of the equipment in the field. Similarly, the field men, being detached, were able to see only the small part of the problems that affected them individually, for which reason they were in no better position to bring about improvement in the general situation. Even if the field men had known of the problems that affected the equipment as a whole, they could have done little towards improvement, as their tools, etc., were not of a nature to permit such action.

Recognizing the weakness of the existing system, and the need for some central authority that could give full-time attention to the maintenance and operation of the equipment, the whole system was reorganized in the latter part of 1935. Responsibility for main-





Left—Relief Engine Ready for Shipment. Below—Motor Car Undergoing Major Repairs

Some of the Early Cars Sent in Were Unfit for Further Service and Were Retired

taining the equipment was placed in the reclamation section of the stores department and a foreman was selected whose sole duty is to see that all work equipment is maintained properly and to confer with division officers as to its operation. In other words, his duties are those of a supervisor of work equipment.

All motor cars and other gasoline-driven units, except air compressors, cranes, weed burners, and tractors are sent to the reclamation shop when in need of repairs. The air compressors, cranes, weed burners, and tractors as well as all steam-operated equipment and other units that come under the M.C.B. rules are sent to the mechanical department shops. Motor cars constitute the major work in the reclamation shop and since this type of equipment is used universally and constantly by the maintenance forces, and in such overwhelming numbers, compared with other types, they illustrate more clearly the benefits that accrue from modernization. For this reason, the new system of maintenance as it is applied to motor cars will be described in some detail.

What Inspection Disclosed

One of the first tasks confronting the new organization was that of obtaining a record of all cars and other units of work equipment in service, their age and condition. While much of this information had been kept by the divisions separately, there was no record as to the condition of the cars, so that all units were inspected individually to assemble the information as to their condition. One of the important items disclosed by the inspection was the number of engines that were in poor condition, although in other respects many of the cars were otherwise serviceable or needed only minor repairs.

When the inspection data were compiled, it was found that almost all makes of cars were represented and that several hundred of them had been purchased from manufacturers no longer in the field, and that there was a still wider variety in design. The condition of the cars ranged from excellent, that is, new or nearly new, to cars that, while still in operation, were unfit for further repairs. The ages of the individual cars ranged from a fraction of a year to more than 20 years.

After this information was compiled, the data were transferred to cards, an individual card being assigned to each unit, upon which is recorded the kind and type, the manufacturer, the manufacturer's designation, the weight, the type of engine, the date of purchase and the original cost. Beginning with 1935, the record includes the cost by years of all repairs from the date of purchase till retirement. A handy cross reference makes it possible to determine quickly the class of repairs, the details of material and labor and the date the work was done and the reasons for making the repairs, that is, whether they were the result of an accident, failure to apply lubrication properly, failure of any part, etc., or general wear and tear.

A further elaboration of this record gives the present location of all cars by divisions, by stations, sections or departments, by states, by engine numbers, by type and class, by manufacturer, and includes a complete history of all transfers and of monthly and yearly operating costs. When a car is given major repairs or is modernized, this fact is recorded together with the new data on weight, engine, frame, etc. In other words, while the record is simple, it contains a complete life history of each car. Only a glance is necessary to detect any abnormal condition with respect to either maintenance or operation and thus to set on foot an investigation of the reason therefor.

Many Engine Mountings

This preliminary inspection disclosed a wider variety of engine mountings than of types of cars. Since many of these engines were obsolete and some were so badly worn as to be unfit for further service, it became necessary to replace them and new engines of modern design and higher efficiency were purchased for this purpose. Since it was necessary to revise the mountings to permit the installation of the new engines, and since so many engines required replacement, it was decided to standardize the engine mountings for each class of car to simplify future replacements in both the shop and the field. These standard mountings have been applied to all cars passing through the shop, whether a new engine was to be installed or the old one was refitted and retained.

Enough cars have now been passed through the shop, so that at present, if an engine fails and the car is in good condition otherwise, it is unnecessary to send the car to the shop. Instead, a number of relief engines are carried at headquarters and, when word of the failure or a request for the replacement of a worn engine comes in, one of these is sent immediately to the foreman. Upon arrival it is only necessary for the foreman to remove 4 to 6 bolts, take out the engine and replace it with the relief engine, a matter of a few minutes. As soon as the bolts have been tightened the car is ready for operation. Special boxes have been provided for the shipment of the relief engines, and the old engine is returned to the shop in the same box.

Operation Checked

As soon as the worn or failed engine is returned to the shop it is inspected and the necessary repairs are made. If the inspection discloses that the failure has resulted from faulty operation, insufficient lubrication or other preventable causes, the foreman of equipment maintenance, in company with the roadmaster, visits the track foreman at the first opportunity and instructs him how similar trouble can be avoided in the future. The worn engine is repaired, and held for the next request. A repaired engine sent to the line is installed permanently so double handling is unnecessary. While it may be necessary occasionally to use a new engine for relief purposes, in general they are applied to cars that are being rebuilt. In other words, to insure the greatest benefit from the purchase of the new engines, so far as is consistent it is the policy to employ rebuilt engines for relief purposes and to apply the new engines to cars that are being modernized.

In like manner, to avoid as much as practicable the shipment of cars to and from the shop, and to eliminate the necessity for sending mechanics out on the line, a similar policy has been adopted with respect to wheels, axles and bearings. If for any reason a wheel, an axle or a bearing requires

replacement, provided the remainder of the car is in good condition, the part, or parts, is sent to the foreman with a gage and full instructions relative to the proper method of installation. The foreman returns the old part to the shop for inspection. If the damage is of such a character that the foreman cannot make the replacement the car is sent to the shop and a relief car is provided until the damage can be repaired and the car returned to the foreman.

Relief Cars Also Provided

Each roadmaster is provided with two relief section cars, both of which are maintained in first-class condition. In this way temporary replacement of damaged or defective cars can be made quickly with the minimum of lost motion. When a car becomes unserviceable for any reason the roadmaster sends one of his relief cars to replace it. If only the engine, an axle or one or more wheels is involved, and the frame and engine are in good condition, these parts are replaced in the field in the manner already described.

If the damage is more extensive, the car is shipped to the shop for attention. As soon as repairs are completed the car is returned to the section and the relief car is returned to the roadmaster. If, on the other hand, it is found that the cost of repairing the car is too great to warrant doing so it is retired, the relief car is assigned temporarily to the section, a new car is purchased, and sent to the roadmaster to assign to the section. To obtain the maximum benefit from the new cars that are purchased, it is the policy to use only rebuilt cars for relief purposes. One of the relief cars assigned to each roadmaster is intended for use when regularly assigned cars are sent to the shop and the other is held for emergencies. It is also the policy to hold two or three cars at the shop as a further reserve for relief or emergency use.

Old Cars Modernized

At the time of the first inspection some cars were found to be in excellent condition and others that required only minor repairs to put them in first-class condition. These latter were ordered into the shop and then were sent out as relief cars. This established a reserve that enabled the several divisions to send in their worst cars for the first cycle of modernization. While the selection for modernization was not based primarily on age, obviously the cars first selected for this purpose were usually the older designs. If their condition was such that repairs could not be justified, they were retired and new cars were purchased to replace them.

Most of the older cars were too heavy for the present-day section gangs of two or three men to handle. For this reason, a policy has been adopted that calls for lighter frames for all section cars. In general, the older section cars ranged in weight from 1,100 to 1,500 lbs. When the frame was in good condition and the car could be rebuilt with sufficient capacity, a few of these larger and heavier cars were fitted with larger engines and remodeled into extra-gang cars. If the engine could be salvaged and the remaining parts were usable, light-weight metal frames were provided, thus reducing the weight to from 750 to 1,100 lbs., depending on the make and the original design.

In the beginning, in the desire to recondition as many of the cars as practicable, that were in the poorest condition, little was done beyond making the repairs necessary to put them in serviceable condition. As the worst of the situation was cleaned up, however, it was decided to modernize all of the equipment that was in such condition that this could be done economically. In doing this, more efficient engines, lighter frames, water-keg carriers, extension handles, level board brackets, warning gongs, torpedo cases, flag cannisters and other accessories were applied to these older cars as needed. Axles, wheels, bearings, brakes, etc., were standardized for each class of car and the latest designs for these items were applied.

Operating Costs Reduced

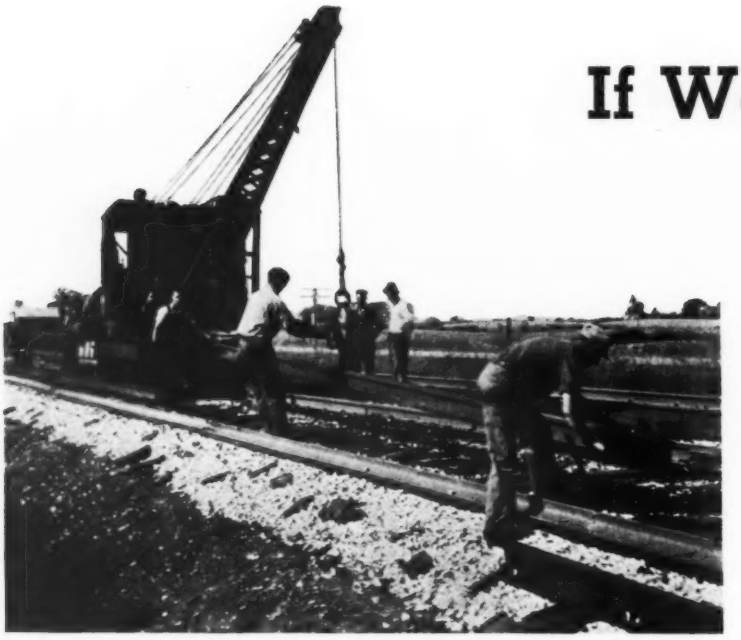
When a car is received at the shop it is given a thorough inspection and test and all work to be done and all material to be applied are listed. This list is placed in the hands of the foreman of work equipment who is held responsible for the quality of the work turned out. Precision work is insisted on, and every part receives careful inspection before it is applied as the car is assembled. If the engine is in suitable condition, the cylinder is rebored and it is fitted with new oversize pistons, and bearings. As one measure of the improvement that has been made through the application of new engines and through this insistence on precision work in the reconditioning of old engines, fuel costs for all motor cars in service have been reduced by 25 per cent, and to a considerably greater extent for many of the individual cars. As a further indication of the better condition of the engines, during 1938 there was a reduction of 66⅔ per cent in the consumption of spark plugs compared with 1935, the year the present plan was organized. As a further means of improving motor-car operation, roadmasters have been provided with ammeters with which to test batteries, since which battery consumption has been reduced by 30 per cent.

Many Cars Retired

Whenever a car is sent to the shop, an estimate is made of the cost of repairs, or of modernization if the car is of an older design. The costs of immediate repairs to or replacement of the engine and of the frame are calculated separately and in combination. These figures are compared with the previous costs of maintenance, and with the cost of a new car, and the age and general condition of the car are considered. If these costs seem to be excessive or if the general condition of the car or the stage of obsolescence does not warrant the expense, the car is retired and replaced with a metal-frame car.

When the present system was established in 1935, there were 1,159 motor cars in service, including section, extra-gang, inspection and department cars. During the three years that the present system of maintenance has been in effect, in addition to those receiving minor repairs, 725 cars have

Two Spike Pullers That Have Been Repaired and Are Ready for Service Shown in Shop



Three Men and a Crane Set in Rail Today

If We Had No Work

By H. R. CLARKE

Engineer Maintenance of Way, Chicago, Burlington & Quincy

An attempt to visualize the revolution in methods and in costs in maintenance work that would result if we reverted to the "horse and buggy days" of 25 years ago

A RATHER popular sort of fiction is that which attempts to portray living conditions and methods during and following some great disturbance or disaster, such as an invasion from Mars or very advanced mechanical development and social evolution. To write such fiction successfully requires a vivid imagination; yet everyone who knows how essential work equipment is to modern maintenance of way methods and organization, realizes that it would be a major disaster if we were suddenly and unexpectedly deprived of its use.

As we think of work equipment as it is used in the maintenance of way department, it naturally divides into two groups, (1) the heavy equipment without which it would be practically impossible to handle our work at all, and (2) the lighter equipment that makes possible more accurate, efficient and economical work, but which could be replaced, in some measure, by increased force and rearranged methods and organization.

Heavy Equipment Indispensable

Under the first heading, heavy equipment, come such units as pile drivers, derricks, heavy-duty locomotive cranes, steam shovels, certain types of cars and equipment for handling dirt or ballast, steam ditchers, spreaders, etc. Much of this equipment has been in use longer than any of us now active in maintenance work can remember, although it has been materially developed and improved. Pile drivers, derricks and cranes are self-propelled instead of being handled by a locomotive and the old drop hammer has been replaced by the more rapid steam hammer; cars for handling dirt and ballast have been improved until they are almost automatic in operation; spreaders have been made more flexible and adjustable and steam shovels have been mounted on crawler treads instead of trucks. All of these developments have increased the efficiency and adaptability of the equipment, but the basic principles are unchanged.

All of the equipment just mentioned has been in use so long and the work in which it is used is so heavy that we can hardly conceive of working without it. Just how we would manage to do our work without pile drivers or heavy cranes and derricks is beyond imagination, and the thought of the force and time that would be required if the other heavy equipment mentioned were not available, is staggering and almost as impossible as to think of operating a railroad without locomotives and cars.

It is when we consider the lighter units which have not been in use so long, that we can think how we might handle our work without such equipment, but at the same time visualize what it would mean and form some idea of the adjustments and changes that would have to be made in our methods and organization. Most of this lighter equipment has been developed within the last 20 to 25 years. Its introduction was gradual and usually the ultimate result was not foreseen; in fact it may not yet be known. At first the equipment was not very reliable or efficient; those offering it for use had to be determined, resourceful and persistent, those using it equally patient and co-operative.

During most of the time that the equipment that we are now considering was being developed and put into use, labor was scarce and hard to secure and not very reliable or efficient. Labor-saving devices were absolutely essential to supplement such forces as were available, increase efficiency and relieve maintenance of

The Modern and Old Way

Equipment

No One Would Want to Go Back to the "Rail Tong" Days

way forces, so far as possible, of work that was difficult, monotonous and almost drudgery. It was this situation which encouraged and in fact made inevitable the development and use of work equipment, and it was the keen realization of the situation that made railroad maintenance officers as helpful and co-operative as they were.

The development and adoption of equipment was gradual. As it came into general use and maintenance men became familiar with it and learned its advantages and limitations, methods of doing the work and the organizations to do it were changed and adjusted as experience indicated should be done. These necessary adjustments have now generally been made, at least so far as the equipment at present developed and largely in use requires. So it is with forces and methods, keyed and adjusted to modern practices that we would face the question, "What would we do if there were no work equipment?"

in Gang Transportation

The Track Motor Car

As we attempt to answer this question, perhaps the first unit of equipment that comes to mind is the track motor car. Most of us well remember the day of the hand car for track and bridge gangs and the "three wheeler" for roadmasters, master carpenters, linemen, water service repairmen, signal maintainers, etc. Those of us who have used these cars as a means of transportation probably think first of the drudgery involved and second of the limitations imposed. I suspect that if we had to make a choice and could do so, the track motor car would be about the last device we would surrender.

In the days of the hand car, sections were not more than 5 or 6 miles in length and such limited mileage was justified by the time required to get to and from work with the hand car and the track structure we had at that time. Today sections are 10 to 12 miles in length and even longer and this assignment is equally justified by improved means of transportation on the motor car, a greatly strengthened track structure, requiring very little of the emergency work and patching which was needed not so many years ago and the very light and infrequent traffic on so many lines, particularly branch lines. However, without the motor car, the time required to go to and from work would become the governing factor and necessarily sections would have to be shortened and the number increased, possibly both to the old standards of 6 to 8 miles. Also, with the eight hour day we now have, instead of ten hours which was the basic working day in the hand car era, travel time becomes more important. So we could expect shorter sections and an increased number of them.

Unfortunately, we can not count on increased revenues and as there is only a certain amount of money available, there can be no increase in the total number of men employed. In fact the number might and probably would be less, for the individual average rate would be increased by more foremen and fewer laborers, and we might find ourselves in the embarrassing position of certain armies which are said to be composed of "all officers and no privates." This condition is made more critical, and no man, whatever his rank in the maintenance of way department, should forget it, by the constant demands of employees in other groups for a larger share of the railroad earnings to be paid to them for work not needed and all too often not done. These demands are not being complied with willingly by railroad managements, but compliance is being forced by the rulings made by various boards having jurisdiction.

Mention has been made first of the result on section forces. The effect on extra gang, bridge and building gangs and water service and signal department forces, as well as on those in the supervisory ranks, would be almost as marked. Extra gangs would necessarily be parked closer to the location of the work, often requiring the construction of temporary tracks and many times located in less desirable places from the standpoint of the men. The same would apply

to bridge and building gangs and as their mobility would be so greatly curtailed, a radical change in organization and methods of working would be called for. The same would apply to the smaller units, such as signal and water service forces, to an even greater degree and the efficiency of the supervisory officers and also the comparative ease with which they can now handle their work would be greatly changed.

Power Tools Have Taken Much of the Drudgery Out of Bridge Work

Distributing Material

Motor cars were first thought of and used as a means of transporting men in the maintenance of way department, but as they have been developed and improved, a very important auxiliary use has been made of them in the handling and distribution of material. In this service they are used in a great variety of ways and in handling all kinds of material. The most common and perhaps important uses are the handling of ties and tie plates for exact distribution and placement where they are to be put in; the handling of bridge timber from the station tracks where it was unloaded to the bridge where it is being used; the distribution of material of all kinds in and around yards and the final distribution of small track material ahead of rail relay gangs. If the motor car was not available for this work it would have to be done much more slowly and laboriously with hand and rubble cars, or train service would have to be used to a greater extent. Either would greatly increase the cost and the use of either work train or other train service would very often seriously interfere with traffic.

Rail Laying Equipment

Possibly next in importance after motor cars come those units of equipment employed with rail laying gangs. Spike pullers, bolting machines, adzers, rail laying cranes and power drills used by both track and signal men would not be available and without them the well-organized and efficient gang now generally used would quite likely not be possible. The number of men required would be greater while the drudgery and difficulty, and also the danger, of the work would be increased. It is only necessary to mention the rail crane, which with three or four men easily and safely sets in the rail as fast as required. Twenty or more tongmen would be required to replace it and these men would slip and slide, tug and strain, to set in the rail, increasing the chance of injury to themselves and to the rest of the gang.

None of us would like to go back to hand adzing, not only because of the increased force required, but even more by reason of the much less accurate and exact work possible with hand adzing as compared with the machines. The cost of the rail and fastenings and the strain and load to which they are subjected under modern traffic and speed, demand the greatest care, exactness and accuracy in all work connected with handling and laying rail.

Tie Tamping Equipment

One thinks also of tie tamping equipment. The speed at which all trains are operated today on principal main lines requires almost perfect line and surface. Slight inequalities and irregularities which would not have been noticed a few years ago must now be corrected. Tamping equipment is of great value, in fact almost indispensable in this exacting work, both in doing it at all and in doing it more permanently. Practically every other unit of work equipment, if not available, would involve changes in both organization and methods, similar to those that have been suggested in the few units of work equipment that appear to me to be the most outstanding items.

One other piece of equipment, or perhaps it should more appropriately be called a practice, which should be mentioned because of its effectiveness and economy, is that of welding and hardening rail ends, frogs, crossings and switches. Rail end, frog and crossing batter has always been a serious matter and present day speeds have only increased the importance of correcting it. As in line and surface, a degree of batter that was not even noticed some years ago is now serious and must be corrected, not only on account of the noticeable effect it has on the riding of the train, but also because of the rapidity with which it increases and the result on angle bars, ties and surface of track if not corrected at the proper stage of development. The important part played by the better quality of rail which has been available for the last few years and improved methods in laying and taking care of it when laid, in making it possible to maintain track under present high speeds of traffic at a reasonable cost, cannot be overestimated, and it is not hard to imagine the situation if "rail end batter" was the valid reason for rail relay that it once was.

Bridge and Building Units

The list of units of equipment used by the bridge and building department is longer than that of the track department and the changes in working methods that would be necessary and the increased cost that would follow would be as serious as in the track department, at least in proportion to the force employed and the money spent by the two departments. Air or electrically-driven power saws, drills and wrenches, air hammers and drills, sand blasting equipment and paint spray outfits, power-operated jacks, pumps, concrete mixers and vibrators, to mention only a few, are in very general use.

It was a common sight a few years ago to see a number of men trying to control the water in a cofferdam or other wet excavation with hand pumps. If a power pump was used at all it was steam-operated, cumbersome to set up and could not be used in many places. The compact, light and efficient power pumps in use today have eliminated this drudgery. The concrete mixer has eliminated the back-breaking labor of mixing by hand and produces a better concrete while the quality is still further improved by the vibrator now generally used, if the structure being poured is of any size. To be deprived of such equipment would be like going back to the "stage coach days." It might

be more leisurely but it would not be efficient or in step with the modern developments in other industries and no maintenance man would be content under such conditions.

The first duty of the maintenance of way department is to keep the line open and the second is to open the line if something beyond our control interrupts traffic. When it is necessary to drive a bridge to open the line, the work cannot be done quickly enough and the most modern equipment is none too good. Our difficulties would be greatly increased and explanations to headquarters made more difficult if we were forced to use the old style pile driver with a drop hammer, handled by a locomotive and limited in its swing; make the cut off with a cross cut saw and do the necessary drilling by hand; working at night with dim and uncertain lights instead of, as we do today, using a modern self-propelled driver, with a small but rapid self-propelled crane bringing all heavy material to the front, supplemented by power saws and drills and electric lights.

Preframing Machinery

Machinery not generally thought of as work equipment, because it is not used out on the line, but which should be mentioned, includes machines for pre-adzing and boring ties and pre-framing bridge and building

A Power Adzer Will Do the Work of Many Men With Hand Adzes

material before treatment. Perhaps no one thing has done more to make possible comparatively permanent track and structures and reduce the cost of maintenance than the treatment of ties and timber. Pre-adzing, boring and framing have done much to improve the quality of the treatment work done and if we were unable to continue this modern and desirable practice, it would constitute a backward step that would be almost as serious as any other mentioned.

Frisco Modernizes Its Equipment

(Continued from page 157)

been given major repairs or modernized in the shop and new engines have been provided for others, while 229 cars of all classes have been removed from service and 80 cars have been purchased, a net reduction of 149 cars, leaving 1,010 now in service.

Formerly, a shortage of cars occurred frequently because of the number that were not in serviceable condition. Despite the reduction that has been made in the number of cars, there has been no shortage of any class in almost two years and today all of the cars in use are in excellent condition for service.

Costs Reduced

During 1936, the cost of all repairs made in the shop, including the cost of new engines, axles, wheels, bearings, frames and parts for the engines that were reconditioned, amounted to $46,500; in 1937 this had been reduced to $44,365; and in 1938, to $43,570. In these respective years 239, 230 and 256 motor cars were given major repairs or modernized. During the same period, in addition to the new engines that were applied, 116, 130 and 75 relief engines were overhauled, rebored and refitted, and a number of other units of equipment repaired.

As has been mentioned, both major repairs and modernization included the provision for lighter metal frames, the application of new engines where required or the reboring of cylinders and the fitting of them with new oversize pistons, rings and bearings, as well as the application of standard engine mountings. Similar work was done on relief engines. For the years in question, the cost of repairing and modernizing motor cars has averaged $158, $156 and $151 each, and during the same period the cost of reconditioning the relief engines has been $73, $64 and $62. It will be noted that the number of relief engines passing through the shop dropped sharply in 1938 as the effect of the application of new engines began to be felt, and a further reduction, not only in the number but in the cost of repairs, is expected as this effect is more fully realized. It is also expected that a comparable number of cars coming in for major repairs, modernization or retirement, will be handled in 1939, after which there should be a similar drop in this item.

These shop costs include all items of labor and material, the stores-department expense for handling, and freight on all cars shipped in and returned. To these is added an overhead charge, which fluctuates somewhat from month to month but averages 25.85 per cent of the sum of the foregoing items, which includes depreciation on the shop building and machine equipment, light, heat, power and supplies other than the material going directly into the cars and engines. The salary and traveling expenses of the foreman of equipment maintenance are not included as they are supervisory items.

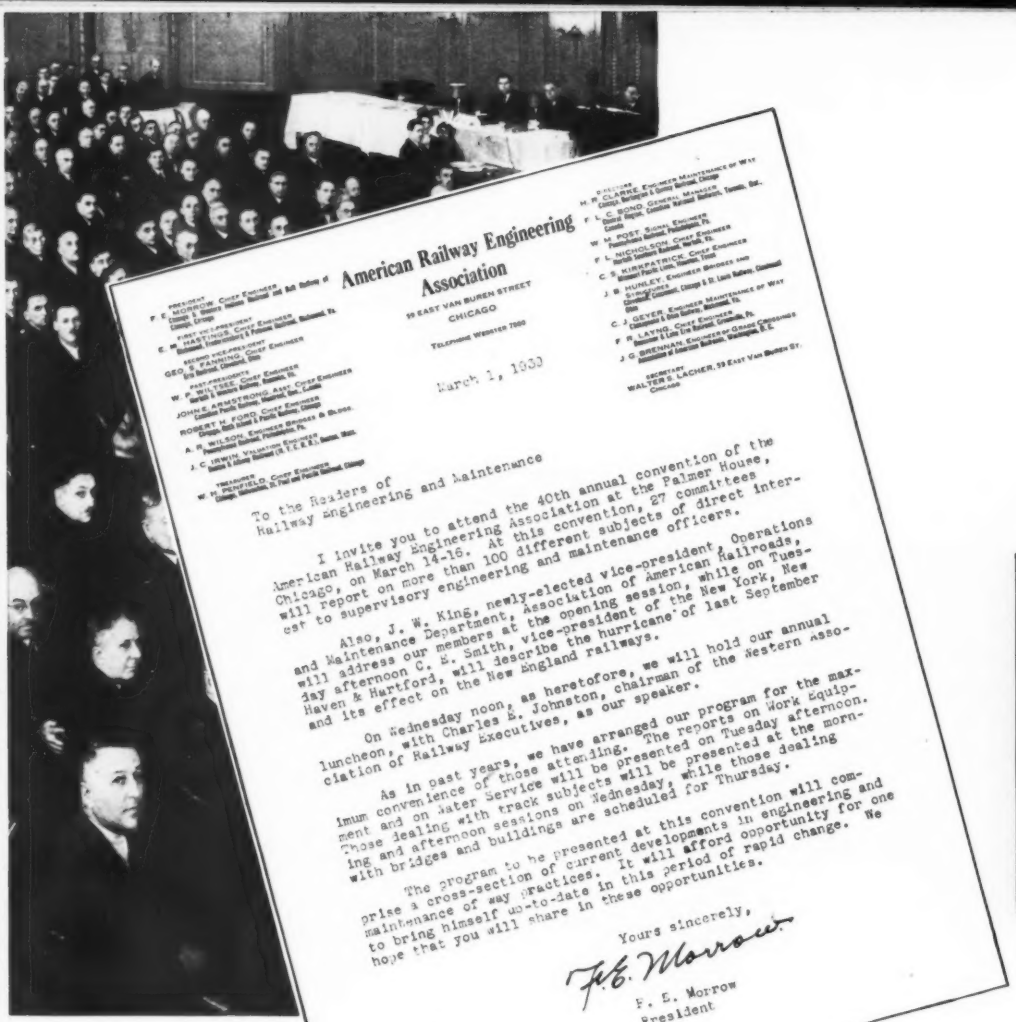
When the system of equipment maintenance was reorganized, the positions of the division repairmen were abolished, these men being assigned to other duties. This reduction in the local forces has had a favorable effect on a comparison of the cost of the new and the older systems, especially when the condition of the equipment under the two systems is considered. This was made possible because the plan of assigning relief cars to each roadmaster's district eliminated the necessity for field repairs, except for the replacement of certain parts, as has been described.

Partly to keep himself informed as to the condition of the various units on the line and partly to carry out educational work relating to the operation and care of motor cars and power machines, the foreman of equipment maintenance spends about half of his time on the line in company with roadmasters. In addition to these line inspections, all power machines are inspected thoroughly in the fall and sent to the shop for needed repairs. So far as possible, the failure of parts is foreseen; reliance for this is placed on the operators, and provision is made for replacement in advance of failure.

Three years ago a large number of the motor cars in service dated back to 1915 or earlier. Since 1935 most of the cars purchased prior to 1923, have been retired. At present, owing to the large number of cars that have been modernized and otherwise overhauled, the average age since being given major repairs is 4½ years. In view of the character of the work that is being done on the cars as they pass through the shop, especially the application of new engines, wheels, axles and metal frames, it is expected that this average will increase materially within the next few years.

The reorganization of the system in 1935 was carried out by C. T. Blume, who was appointed foreman of work equipment maintenance, under the general direction of F. H. Shaffer, general manager. At present the work is being continued by Mr. Blume under the direction of S. J. Frazier, assistant to general manager.

A.R.E.A. 40th



American Railway Engineering Association
59 EAST VAN BUREN STREET
CHICAGO
TELEPHONE WEBSTER 7000

March 1, 1930

To the Readers of
Railway Engineering and Maintenance

I invite you to attend the 40th annual convention of the American Railway Engineering Association at the Palmer House, Chicago, on March 14-16. At this convention, 27 committees will report on more than 100 different subjects of direct interest to supervisory engineering and maintenance officers.

Also, J. W. King, newly-elected vice-president, Operations and Maintenance Department, Association of American Railroads, will address our members at the opening session, while on Tuesday afternoon C. E. Smith, vice-president of the New York, New Haven & Hartford, will describe the hurricane of last September and its effect on the New England railways.

On Wednesday noon, as heretofore, we will hold our annual luncheon, with Charles A. Johnston, chairman of the Western Association of Railway Executives, as our speaker.

As in past years, we have arranged our program for the maximum convenience of those attending. The reports on Work Equipment and on Water Service will be presented on Tuesday afternoon. Those dealing with track subjects will be presented at the morning and afternoon sessions on Wednesday, while those dealing with bridges and buildings are scheduled for Thursday.

The program to be presented at this convention will comprise a cross-section of current developments in engineering and maintenance of way practices. It will afford opportunity for one to bring himself up-to-date in this period of rapid change. We hope that you will share in these opportunities.

Yours sincerely,

F. E. Morrow

F. E. Morrow
President

FEM:EN

President Morrow of the Association Extends a Special Invitation to the Readers of *Railway Engineering and Maintenance* to Attend the Meeting

F. E. Morrow, President

CLIMAXING another year of activity, the American Railway Engineering Association will hold its Fortieth annual convention on March 14-16. As for a number of years, this meeting will be held in the Grand Ballroom of the Palmer House, Chicago.

Diversified Subjects

For another year the A.R.E.A. has maintained its record of intensive activity, working through 27 standing and special committees composed of 5 to 63 members and representing practically all of the railways of the United States and Canada. Of its more than 1900 members, approximately 860 are represented in committee work, which brings to the association a wealth of knowledge on the diversified subjects which it has under consideration.

At the convention, reports will be presented on nearly 100 subjects, covering a wide range of the every-day and special problems confronting engineering and maintenance officers, problems which are being increased and intensified by the changes which are taking place in the tempo and character of railway transportation, coupled with the continuing demand for maximum efficiency and economy. The reports will deal with such important problems as the proper type and location of culverts; the proper roadbed cross section; the corrosion of rail and fastenings in tunnels; the welding of manganese trackwork; proper bolt tension in joints; rail lengths, in excess of 39 ft; the fireproofing of wood bridges and trestles; the proper method of concrete manufacture; air conditioning of railway buildings; the pitting and corrosion of boiler tubes; the scheduling of the use of work equipment, and many others equally as important.

In view of the broad and diversified program and the increased responsibilities which are being placed on engineering and maintenance officers, it is expected that attendance and interest at the convention will this year attain its usual high level. At the same time, from the reports presented and the discussions which will follow, those who attend the convention are sure to gain information which will be of value to them.

In accordance with the usual custom, the convention will convene on Tuesday morning, and will continue through Thursday. Two general sessions will be held each day, and, as indicated in the accompanying program, related subjects, in so far as possible, will be considered at the different sessions, an arrangement adopted to meet the convenience of those with special interests who may find it impossible to attend all of the sessions.

Joint Dinner

Special features of the program will include an address at the opening session by J. W. King, vice-president, operations and maintenance depart-

to Hold Convention

100 subjects of wide-spread interest will be discussed at three-day session in Chicago

ment, of the Association of American Railroads; an address by C. E. Johnston, chairman, Western Association of Railway Executives, at the association luncheon on Wednesday; and the joint meeting of the association with the Western Railway Club on Wednesday evening.

At this latter meeting, which will be the fourth successive meeting of its kind, The Relation of Locomotive Design to Rail Maintenance will be discussed, "As the Track Man Sees It," by H. R. Clarke, engineer maintenance of way of the Chicago, Burlington & Quincy, and "As the Mechanical Man Faces It," by Kenneth Cartwright, mechanical engineer, New York, New Haven & Hartford. This meeting, which will be held at the Hotel Sherman, will be preceded by a reception in the mezzanine and Club room at 6:00 p.m., and dinner in the Grand Ballroom at 7:00 p.m.

Special Invitation

The regular sessions of the convention will be presided over by F. E. Morrow (chief engineer, Chicago & Western Indiana), president of the association, assisted by Vice-Presidents E. M. Hastings (chief engineer, Richmond, Fredericksburg & Potomac), and Geo. S. Fanning (chief engineer, Erie). In the letter from President Morrow, reprinted herewith, a special invitation is extended to the readers of *Railway Engineering and Maintenance* to attend the convention.

Program

40th Annual Convention

Palmer House, Chicago

Tuesday, March 14

Morning Session—9:45 A.M.

Convention called to order
President's address—F. E. Morrow
Address by J. W. King, vice-president, operations and maintenance department, Association of American Railroads
Reports of the Secretary and the Treasurer
Reports of committees on
- Standardization
- Electricity
- Clearances
- Uniform General Contract Forms
- Economics of Railway Location and Operation

Afternoon Session—2 P.M.

Reports of committees on
- Waterways and Harbors
- Highways
- Maintenance of Way Work Equipment
- Water Service, Fire Protection and Sanitation

Address by C. E. Smith, vice-president (purchases and stores), New York, New Haven & Hartford, on the New England Flood and Hurricane
Adjournment at 4 p.m. for visit to the exhibit of National Railway Appliances Association at the International Amphitheatre

Wednesday, March 15

Morning Session—9 A.M.

Reports of committees on
- Signals and Interlocking
- Economics of Railway Labor
- Track
- Complete Roadway and Track Structure
- Roadway and Ballast

Association Luncheon, 12 o'clock

Address by C. E. Johnston, Chairman, Western Association of Railway Executives

Afternoon Session—2:30 P.M.

Reports of committees on
- Rail
- Stresses in Railroad Track
- Ties
- Wood Preservation

6 o'clock

Joint meeting and dinner with the Western Railway Club at the Hotel Sherman
"The Relation of Locomotive Design to Rail Maintenance"
"As the Track Man Sees It," by H. R. Clarke, engineer maintenance of way, Chicago, Burlington & Quincy
"As the Mechanical Man Faces It," by Kenneth Cartwright, mechanical engineer, New York, New Haven & Hartford

Thursday, March 16

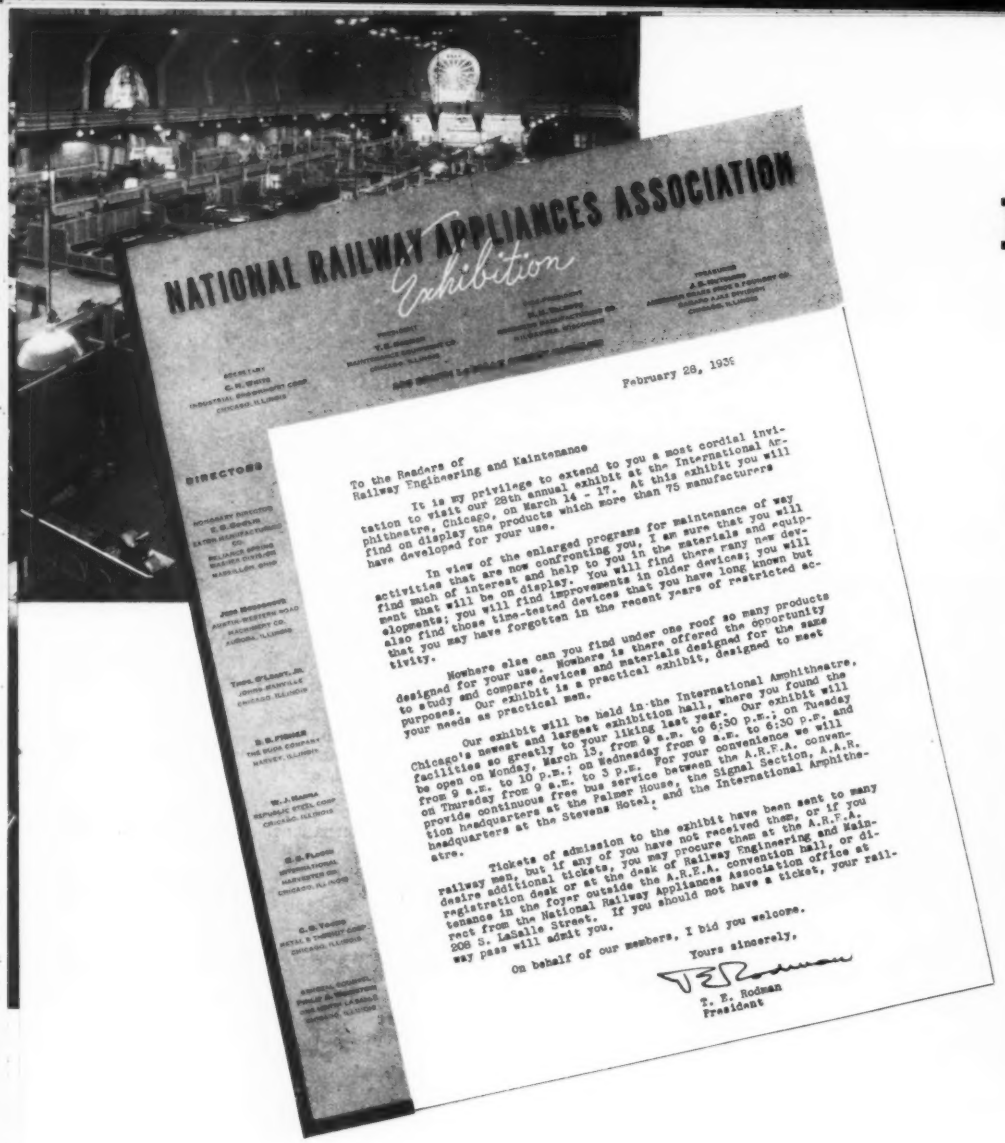
Morning Session—9 A.M.

Reports of committees on
- Buildings
- Yards and Terminals
- Records and Accounts
- Waterproofing and Railway Structures
- Iron and Steel Structures

Afternoon Session—2 P.M.

Reports of committees on
- Masonry
- Economics of Bridges and Trestles
- Wood Bridges and Trestles
- Impact

Closing Business



Equipment Exhibit

National Railway Appliances Association to present twenty-eighth exhibit at the International Amphitheatre, Chicago.

T. E. Rodman
President

AS set forth in the above letter from T. E. Rodman, president of the National Railway Appliances Association, railway officers attending the convention of the American Railway Engineering Association in Chicago on March 14 to 16, inclusive, are cordially invited to visit the twenty-eighth annual exhibit of the N.R.A.A., to be held coincident with the convention. The exhibit, which is the outstanding display of the year of materials, equipment and devices employed in the construction and maintenance of tracks, bridges, buildings and water service facilities, will be held for the second year in the large and attractive exhibition hall of the International Amphitheatre. It will be open to visitors during four days, beginning on March 13, one day ahead of the American Railway Engineering Association convention, to afford maximum opportunity for those attending the convention to study the individual exhibits without encroachment on their convention activities. The exhibit will be open to visitors each day as follows:

Monday,	March 13—9:00 a.m. to	6:30 p.m.
Tuesday,	March 14—9:00 a.m. to	10:00 p.m.
Wednesday,	March 15—9:00 a.m. to	6:30 p.m.
Thursday,	March 16—9:00 a.m. to	3:00 p.m.

For the convenience of those who will attend the exhibition at the Amphitheatre, the association will provide continuous bus service between the convention hotel (the Palmer House) and the Amphitheatre, during all hours that the exhibit is open. The exhibit this year is being directed by Mr. Rodman (Maintenance Equipment Company), as president of the association, and C. H. White (Industrial Brownhoist Corporation), secretary. The companies which will participate in the exhibit are as follows:

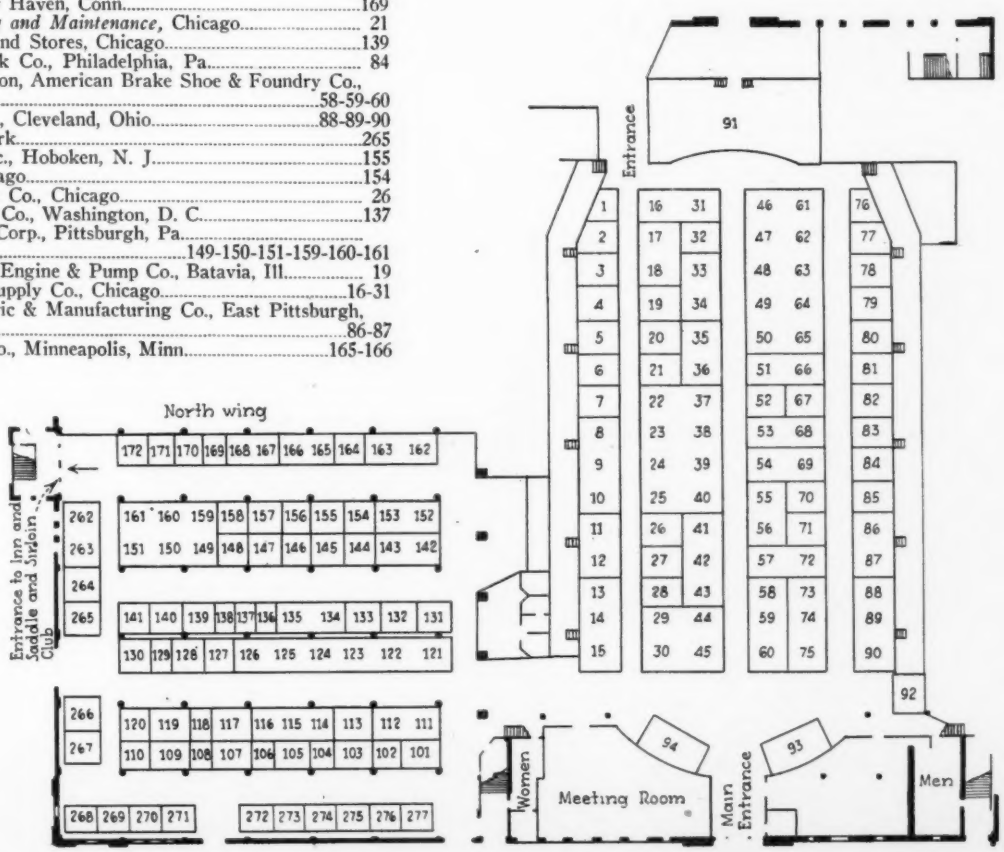
Exhibiting Members

Air Reduction Sales Company, New York....11-12
American Car & Foundry Company, New York....262-263
American Fork & Hoe Company, Cleveland, Ohio....172
Armco Culvert Manufacturers Association, Middletown, Ohio.... 6
Association of American Railroads, Washington, D.C.... 91
Barco Manufacturing Company, Chicago.... 32
Buda Company, Harvey, Ill....29-30-44-45
Chipman Chemical Company, Bound Brook, N.J.... 5
Cleveland Frog & Crossing Co., Cleveland, Ohio.... 27
Cleveland Tractor Company, Cleveland, Ohio....114-115-116
Cullen-Friestedt Company, Chicago.... 83
Dearborn Chemical Company, Chicago....41-42-43
DeSanno & Son, Inc., A. P., Philadelphia, Pa....127
Dickinson, Inc., Paul, Chicago....113
Duff-Norton Mfg. Company, Pittsburgh, Pa....33-34
Eaton Manufacturing Co. (Spring Washer Div.), Massillon, Ohio 52
Elastic Rail Spike Corp., New York.... 4
Electric Railway Improvement Company, Cleveland, Ohio....266
Electric Tamper & Equipment Co., Ludington, Mich....111-112
Evans Products Company, Detroit, Mich....134-135
Fairbanks, Morse & Co., Chicago....22-23-24-25-37-38-39-40
Fairmont Railways Motors, Inc., Fairmont, Minn....46-47-48-49-50-61-62-63-64-65
Fansteel Metallurgical Corp., North Chicago, Ill....156
Hayes Track Appliance Company, Richmond, Ind....138

and Materials at Chicago

Associate Members

Adams & Westlake Company, Chicago
American Chain & Cable Company, Bridgeport, Conn.
American Hoist & Derrick Company, Minneapolis, Minn.
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Austin-Western Road Machinery Co., Aurora, Ill.
Bethlehem Steel Company, Bethlehem, Pa.
Chicago Pneumatic Tool Company, New York
Clay Products Association, Chicago
Crerar, Adams & Co., Chicago
Dimick-Mosher Products Company, Boston, Mass.
Eagle Grinding Wheel Company, Chicago
Frog Switch & Mfg. Co., Carlisle, Pa.
General Electric Co., Schenectady, N. Y.
General Railway Signal Company, Rochester, N.Y.
Ingersoll-Rand Company, New York
Inland Steel Company, Chicago
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Joyce Cridland Company, Dayton, Ohio
Kerite Insulated Wire & Cable Co., The, Chicago
Lufkin Rule Company, Saginaw, Mich.
Lundie Engineering Corp., New York
Massey Concrete Products Corporation, Chicago
National Carbide Corp., New York
National Carbon Company, New York
Okonite Company, Passaic, N.Y.
Positive Lock Washer Co., Newark, N.J.
Positive Rail Anchor Company, Chicago
Pyle-National Co., Chicago
Q & C Company, New York
Railway Maintenance Corp., Chicago
Snow Construction Co., T. W., Chicago
Taylor-Wharton Iron & Steel Company, Chicago
Union Switch & Signal Company, Swissvale, Pa.
United States Gypsum Co., Chicago
Warren Tool Corporation, Warren, Ohio
Wilson Welder & Metals Co., Inc., North Bergen, N.J.
Woodings-Verona Tools Works, Verona, Pa.
Yale & Towne Mfg. Co., Philadelphia, Pa.
Youngstown Sheet & Tube Company, Youngstown, Ohio



Floor Plan of the Exhibit

PRODUCTS of Manufacturers

Improved Yard Type Meco Lubricator

THE Maintenance Equipment Company, Chicago, has improved its yard type MB Meco rail and flange lubricator to provide lubrication of both rails of the track. In previous installations of this lubricator, two rail lubricant distributing assemblies were mounted in series on the gage side of one rail. In the new two-rail type, two lubricant distributing assemblies of a slightly changed design are mounted on the inside or gage side of each rail directly opposite each other.

An Installation of the Improved Lubricator. Note That the Lubricant Container is Flush With the Ground and Covered

The new distributing assemblies are constructed with twice the number of grease discharge outlets provided in the single-rail type assemblies. The lubricant container is the same as for the older type of lubricator, and is located between the ties close to the rail, with the cover at approximately the level of the top of the ties. This lubricant container extends only slightly beyond the tie line and because of its low height it offers no obstruction to switchmen and others walking along the track. If desired, it may be covered with metal or plank as shown in the accompanying illustration. One actuating ramp and pumping mechanism mounted on the outside of the rail supplies lubricant to both of the lubricator distributing assemblies.

The new lubricator will provide lubrication for both right and left hand turnouts and curves for a considerable distance behind the frogs. It is applied to the rail by means of rugged steel clamps, interchangeable for various rail sections, and can be installed within five man-hours without interference to traffic.

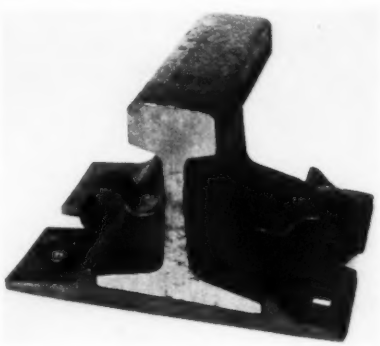
Tie Plate Assembly Has Spring Clips

A TIE plate assembly embodying spring clips for holding the rail in position has been placed on the market by The Rails Company, New Haven, Conn. Known as the Spring-Tite tie plate assembly, this fastening comprises a standard double-shoulder tie plate embodying certain special features, and two spring clips, one on each side of the rail.

The clips are of tempered spring steel and are formed of stock 3/16 in. by 1¼ in. in cross section. The length of steel forming each clip is curved on a 13/16-in. radius at one end, with a short straight section at the extreme end to form a flat surface for bearing against the rail base. At the other end the clip is straight, and when in position in the track this portion of the clip extends under the tie plate. Thus, each clip is in the form of a spring clamp which is applied in a position at right angles to the rail and which holds the rail firmly against the tie plate.

The tie plates used with this assembly are rolled with a transverse groove, 3/16 in. deep and 1-5/16-in. wide, in the bottom for accommodating those portions of the clips that extend under the tie plate. In addition, a section of the tie plate on each side, corresponding to the width of the groove and extending inward from the edge of the tie plate to the shoulder, is cut away entirely. To apply the clip, it is inserted in this opening from the side and is struck a sharp blow with a spike maul or other tool, thereby spreading the clip and forcing the straight portion into the groove and the flat bearing surface onto the top of the rail base. The tie plate is lagged to the tie in the usual manner.

It is said that the pressure exerted against the rail base by the clips in this assembly is sufficient to prevent creepage of the rails, even when they are welded into continuous lengths. Also, it is claimed that the use of the assembly reduces the vertical movement of the ties without at the same time completely restricting the wave motion of the rails. Other advantages claimed for the Spring-Tite rail assembly are that its use results in no damage to the ties, that it is self adjusting to conform to tolerances

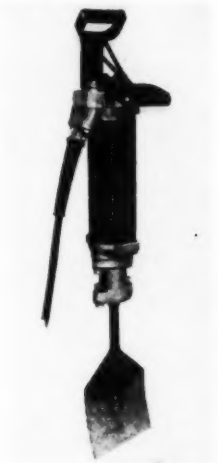


The Spring-Tite Tie Plate Assembly

in the tie plate or the rail, that its large spring radius provides the maximum of both flexure and grip, and that it is economical to apply.

Syntron "High-Speed" Electric Tie Tamper

THE Syntron Company, Homer City, Pa., has developed a "High Speed" electric tie tamper for the rapid and economical surfacing of track ballasted with small stone, gravel, cinders, chatt, screenings, etc. This unit weighs 60 lb., has a



The New High-Speed Tamper Has an 8-In. Blade and Weighs 60 Lb.

speed of 1,800 blows per minute and uses a blade 8-in. wide as a tamping tool.

Like the Heavy-Blow Syntron tamper, which was designed for tamping heavy rock ballast track, the High-Speed tamper, consists of two electro-magnets wound around a hollow barrel which contains a free-moving piston. The piston strikes directly on the shank of the tamper bar on the down stroke and against a synthetic rubber back stop on the return stroke. The electro-magnets are tightly wound, thoroughly insulated and baked to form a solid unit, which is contained in a piece of tubing, with top and bottom castings with tie rods holding the entire assembly together. The unit is equipped with handles with thick, soft rubber grips and the tamping tool is attached in the standard manner.

The power plant, capable of operating 4 to 16 of these tampers, is a small portable engine-generator set mounted on a frame that is equipped with end and side rollers so that it can easily be moved on the rail to each set-up location. The generator produces 30-cycle, single phase A.C. current which is transformed by means of rectifying tubes to two pulsating currents 180 deg. out of phase. Power is transmitted from the engine-generator set to the tampers by a rubber covered, mine-type, three conductor cable 25-ft. long, fitted with Pyle National fittings.

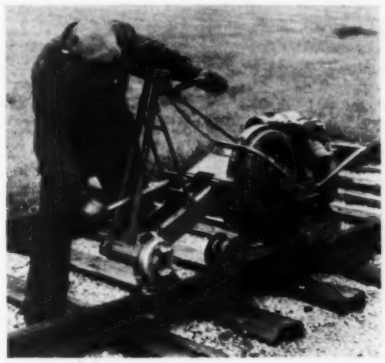
When the magnets in the tamping unit are energized with this pulsating current, the piston moves up and down alternately with each pulsation, striking the tamping bar 1800 blows per minute. While this unit is designed primarily for tamping in small or light ballast, it can be used in rock ballast by substituting a 3-in. by 5/8-in. bar for the 8-in. tamping blade.

Improved Power Wrench

THE Nordberg Manufacturing Company, Milwaukee, Wis., has developed a power track wrench known as the Model CW which is smaller and more compact than the model it supersedes. Two new special accessories for drilling rail and for driving screw spikes have also been developed for this wrench.

The new machine is essentially similar to the earlier model; the engine unit is mounted on a truck with flanged rollers at each end and with a third roller at the end of a guide arm extending to the opposite rail; it is powered with a 4-hp. gasoline engine and the wrenching action is applied at the end of a wrench arm. The entire engine unit and wrench arm can be revolved on a ball bearing turntable, allowing the operator to face traffic when working on either rail and to swing the wrench arm from side to side to tighten bolts on either side of the rail without moving the machine. The engine unit weighs 425 lbs. and can be quickly lifted from its truck by two men. The total weight of the new machine is 550 lb.

The wrench is equipped with ball bearings throughout and has a chuck speed of 72 r.p.m. A 2-in. move-



Employing the Wrench to Drive Lag Screws

ment of the operator's right hand reverses the spindle. The 4-hp. engine provides ample power for starting rusted or frozen nuts or for twisting off 1-in. bolts. An easily adjusted overload release gives uniform tension to every track bolt.

The rail drilling accessory developed for this wrench, which weighs 40 lb., has an automatic feed and can be adjusted for any rail height. When the drill is set in place on the rail, the drive spindle at the end of the wrench arm is simply held against the driving end of the drill in the same manner as when tightening bolts. It is claimed that a hole can be drilled in about on minute.

The screw spike driving accessory can be attached to the end of the spindle arm in about two minutes. When the spike is screwed home, the overload release prevents overdriving

The New CW Power Wrench Is More Compact Than the Model It Supersedes

and consequent damage to the wood fibers. The spindle speed of this accessory is 150 r.p.m.

New International TD-18 TracTracTor

THE International Harvester Company, Chicago, has announced a new crawler-tractor, the TD-18 TracTracTor, powered by a six-cylinder Diesel engine, which is designed specially for heavy-duty service. This new tractor, which is larger than the other five models already produced by this company, weighs 21,500 lb. with standard treads spaced 62 in. center to center, or 22,000 lb. with special treads spaced 74 in. center to center. The tractor is 158 in. long and its overall width is 82 in. equipped with narrow treads and 92 in. with wide treads. The treads of both types have a ground contact 84⅝ in. long, and can be furnished with shoes of various widths suitable for different ground conditions.

The New International TD 18 TracTracTor

The six-cylinder engine, which develops a maximum of 70 drawbar horsepower, is of the four-cycle, full Diesel type; operates at 1200 r.p.m.; has a cylinder bore of 4¾ in.; and a stroke of 6½ in. The transmission provided has six forward speeds from 1½ to 5¾ m.p.h., and two reverse speeds, 1½ and 3¼ m.p.h. The diameter of the engine clutch is 17 in. and the transmission is of the selective type.

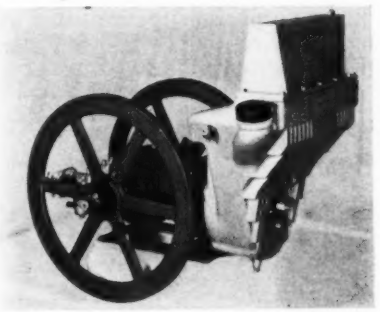
As is the case with other International Diesels, the TD-18 is started on gasoline with an automotive-type electric starter, and after a minute or less operation, shifts to full Diesel operation. It is claimed that the engine is started easily from the seat, regardless of weather.

Other features include a clutch brake for fast gear shifting; power-actuated steering clutches which make steering easy; adjustable steering levers and pedals to suit the operator; ball-and-socket outer pivots, special diagonal arm inner pivot bearings, and roller stabilizer to relieve the pivot shaft of twisting stresses and keep the tracks in alignment; track shoes keyed to track links to eliminate the loosening of shoes; full-pressure engine lubrication at all working angles by the triple-gear oil pump; special gravity lubrication for track rollers at low speeds and pressure lubrication at high speeds; quintuple-sealed track rollers to keep out dirt; Tocco-hardened crankshaft with replaceable main and connecting-rod bearings and unit construction by which each steering brake, steering clutch, track frame assembly, and other units can be adjusted or replaced without disturbing adjacent parts.

Regular equipment includes a precision-type Diesel injection pump, 18-in. shoes, overcenter clutch, and electric starter. Special equipment items include power take-off; forest shield attachment; hood side doors; radiator shutter; electric lighting attachment; crankcase guard; front bumper; radiator guard; front pull hook; and combined muffler and spark arrester.

Many Improvements in Fairmont Motor Cars

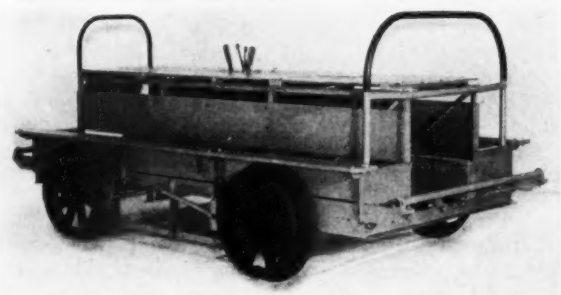
DURING the last year, Fairmont Railway Motors, Inc., Fairmont, Minn., has incorporated a large number of improvements in its entire line of track motor cars to increase their serviceability, ease of handling and more ready availability for inspection and repair, and, in addition, has added an entirely new line of cars, comparable in many respects to certain of its existing models, but incorporating new roller bearing engines.



The RO Fairmont Roller Bearing Engine

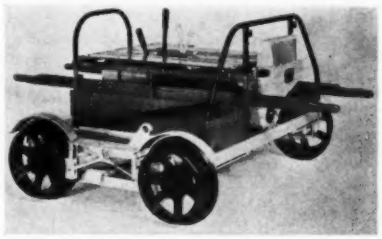
The new car models include the M9 Series D one to two-man inspection car; the 59 Series D one to two-man inspection car; the M19 Series E one to four-man inspection car; the M14 Series G light section car for one to six men; the S2 Series F standard section car for one to eight men; the S2 Series G heavy-duty section car for two to twelve men; and the A2 Series C heavy-duty section car for two to twelve men and one to two trailers.

These new models are equipped with either of two sizes of the new roller bearing engines; the Type R0, with 5-8 hp., for inspection and light section cars; and the Type RQ, with 8-13 hp., for standard and heavy-duty section cars, both two-cycle, water-cooled engines, which, in many respects, are comparable to the Type 0D and Type QBC ball bearing engines which have been and are still furnished by the company in certain of its car models. The outstanding feature of these new engines is their new crankshaft mounting, employing three solid roller bearings, which is said to afford exceptional strength and durability, with unusual maintenance advantages, while at the same time increasing the load capacity of the engine approximately 40 per cent. Like the ball bearing models of the company, the new roller bearing engines are water-cooled and reversible, but a



The A2 Series C Heavy-Duty Section Car for 2 to 12 Men

greater cooling area has been provided, which increases their efficiency under difficult or adverse operating conditions. Like the ball bearing engines also, the roller bearing engines are equipped with the Fairmont standard carburetor, patented throttle valve, and positive uniform-acting timer and battery ignition. As installed in the three new inspection car models, the roller bearing engines are equipped with a side exhaust, which carries exhaust gases outside of the car where they will not bother the operator or other men being transported.



The M9 Series D Inspection Car For One to Two Men

The new M9 Series D inspection car for one or two men, with its 5-8 hp. engine, is of the center-load type, with an aluminum frame; has a load capacity of 500 lb.; a total weight of 515 lb.; and a lifting weight at the rear, with extension handles, of only 95 lb. A feature of this car is that it is spring-mounted to increase riding comfort.

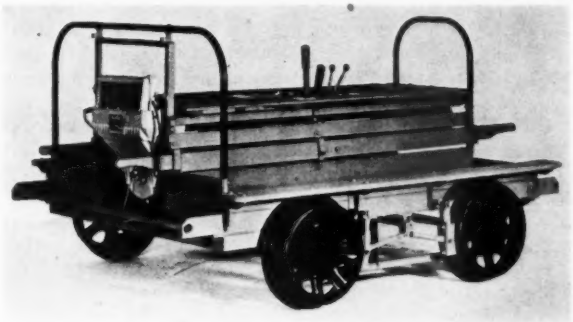
The Model 59 Series D inspection car, for one or two men, has its 5-8 hp. engine off center laterally in order to provide an extra wide tray for carrying tools and supplies. Other than this, it is comparable to the M9 Series D in practically all respects, except for a total weight of 585 lb., and a lifting load of 105 lb.

The new M19 Series E inspection car for one to four men, with its 5-8 hp. roller bearing engine, is comparable in many respects to the M19 Series D, roller bearing engine inspection car; has an aluminum frame; a capacity of 750 lb., and a lifting weight on extension handles of 95 lb.

The new M14 Series G one to six-man light section car, with 5-8 hp. roller bearing engine, is comparable to the M14 Series D section car with ball bearing engine; has a steel frame; a capacity of 1200 lb.; a total weight of 750 lb., and a lifting weight on extension handles of 105 lb.

The new S2 Series F standard section car with 8-13 hp. roller bearing engine for one to eight men is comparable to the S2 Series E section car with ball bearing engine; has a steel frame; a load capacity of 1800 lb.; weighs 935 lb.; and has a lifting load on extension handles of 145 lb.

The new heavy-duty section cars of the company, both of which are equipped with 8-13 hp. roller bearing engines, are the S2 Series G and A2 Series C. The former of these, designed to handle two to twelve men, has a steel frame; a load capacity of 1800 lb.; weighs 1150 lb.; and has a lifting weight of 321 lb. The A2 Series C car, on the other hand, which will seat up to 12 men and haul one or two trailers, has a load capacity of 2500 lb.; a total weight of 1360 lb.; and a lifting weight on the extension handles of 420 lb.



The M14 Series G Light Section Car For One to Six Men

All of the new model cars with roller bearing engines are equipped with demountable wheels and differential axle, except that this axle is extra on the 59 Series D car. In addition, all of the new section car models have a tilting housing seat, and all of the new model inspection cars are equipped with removable seats, these features providing easy access to the engine and increased convenience for inspection, cleaning and adjustment. In the case of the older model cars of the company, with ball bearing engines, the housing seats have been redesigned with a minimum number of holding bolts to increase the speed and convenience of their removal for inspection purposes. In addition to the improved features embodied in the new cars equipped with roller bearing engines, all section cars of the company have been redesigned in a number of respects, and fitted with extension lifting handles which can be used at either the front or the rear of the car.

Another development in Fairmont cars is the application to all of them of a standard method of control, so that each operating lever is in the same relative position, regardless of car model. This change was made in the interest of increased safety and convenience to operators who have occasion to use the different car models.

In addition to the new roller bearing engine model cars developed by the company and the many improvements in its ball bearing engine model cars to increase their efficiency, make them easier to handle and more accessible for adjustment, the company has also provided a new housing and frame design for its heavy-gang cars with 4-cylinder, 4-cycle engines, designed especially to permit ready accessibility for adjustment and repair.

Improved 15-Ton Emergency Jack

TEMPLETON, Kenly & Company, Chicago, has developed an improved model of its No. 310 fifteen-ton emergency jack which is designated as the No. 310A. The new jack embodies a number of improvements, including one inch greater lift, making a total of 14 in.; triple-toothed lifting and retaining pawls; an increase of 10 sq. in. in base area; an increase in rack bar toe lift to more than 2 sq. in.; a base locking hook which can be engaged or disengaged by the operator's foot; more convenient carrying handles and a greater rack bar gib slide bearing. It is said that these improvements

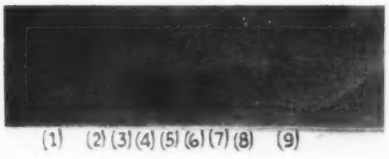
The Improved 15-Ton Emergency Jack

provide 37 per cent easier lifting; greater overload capacity, as shown by actual hydraulic press test; and that the load may be raised or lowered the full limit of the rack bar when working at an angle. The No. 310A is furnished with a five-foot steel chain, a forged steel auxiliary shoe and a five-foot heat-treated steel lever bar.

Airco Welding of Wheel-Burned Rails

AN interesting application of the Aircowelding process that has been developed by the Air Reduction Sales Company, New York, is the welding of wheel burns in rails to restore them to surface, in a manner, which is said not to impair the strength of the rail.

In welding wheel burns by this process, loose and defective metal is removed with a chisel, and all defective metal that cannot be removed in this manner is removed with a torch, using an Airco No. 8 or No. 9 tip for small and large rail sections, respectively. The weld is then started at one end of the depression, using a 3/16 in. Airco RR welding rod and the Aircowelding procedure. If the burned spots are more than 4 in.



The Driver Burn Weld Area Subject to the Rockwell Survey Referred to

long, the weld is made in increments not exceeding 3 in. in length, in order to keep the heat input at a minimum. In the case of a long weld, each 3 in. weld is allowed to cool before making the next increment weld. Each weld is smoothed up with a flatter to avoid reheating and overflow metal is trimmed off with a hot cut while the weld is hot. Under no circumstances is the weld quenched. A rail grinder may be used for grinding to surface after the weld is completed.

The Aircowelding process employed differs from puddle welding chiefly in that there is no puddling of the base metal to secure a bond between it and the added metal and only the surface of the base metal, to the extent of a thin veneer, is brought to a molten or fusing state when the weld metal is added. It is said that by this method the application of the added material can start much quicker, the work can progress more rapidly, and the surface of the parent metal is not broken down to the same extent as in the puddle welding method.

Laboratory investigation of rails in which the wheel burns were built up by this method are said to show no impairment of the rail.

Results of Test of Wheel-Burned Rails

	Same Rail Welded Rail	Same Rail Not Welded
Yield—Lb. per sq. in.	80,000	72,500
Break—Lb. per sq. in.	140,000	130,500
Brinell Hardness	331	341
Angle of Bend at Break	53 deg.	34 deg.

Rockwell Survey of Affected Area in Welded Rail

(Shown in the accompanying illustration.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
26	27	25	26	26	27	24	24	25
30	28	27	28	27	28	30	27	29
28	26	26	27	26	25	25	25	27
23	26	25	25	25	24	23	24	27
18	22	22	24	23	22	22	25	21
20	17	19	19	21	22	22	24	17

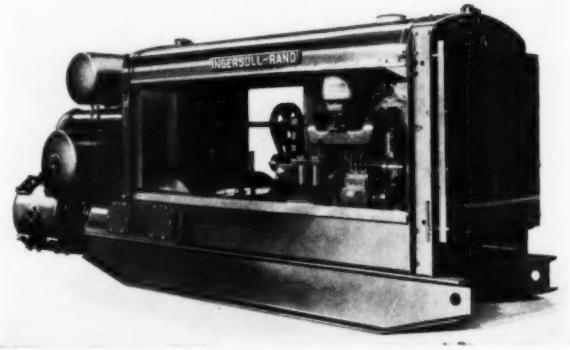
New Heavy-Duty Portable Compressor

A COMPRESSOR capable of delivering 425 cu. ft. of air (actual) per minute at 100 lb. pressure has been developed by the Ingersoll-Rand Company, Phillipsburg, N. J. This compressor, known as Model 425, is a self-contained plant, mounted on a welded structural steel frame. It consists of a horizontal, two-cylinder, two-stage, heavy-duty, double-acting, cross-head type compressor powered with a four-cylinder, four-cycle tractor-type Waukesha gasoline engine with carburetor and high-tension magneto having an impulse coupling. The engine, which operates at 960 r.p.m., is cooled by a circulating water system with radiator, pump and fan, and has a pressure feed lubrication system, "air sealed" speed control for reducing the speed of the engine during the unloaded period, an automatic maximum speed governor, a 50 gal. gasoline tank with special water and sediment traps and a push-button, automotive-type starting system allowing easy starting.

The compressor, which operates at 315 r.p.m., is coupled to the engine by an open type, three-sector, hand-operated clutch connected to silent, spiral-bevel reduction gears. It is equipped with Ingersoll-Rand channel valves and the crank shaft and pinion shaft which are mounted on ball and roller bearings are oiled by a splash system from the "constant-level" oil reservoir in the crank case. The compressor cylinders are lubricated by a force-feed system and the unit is equipped with a large capacity oil-bath intake filter. A separate water cooling system with pump and radiator is provided and complete intercooling between stages of compression is obtained. Regulation is provided by a type XAA auxiliary valve and UL-53 free air inlet unloaders for unloading the compressor cylinders. The air receiver is thoroughly tested and designed to meet the requirements of the A. S. M. E. code and is provided with a safety valve, pressure gage, and service and drain valves.

It is stated that the Model 425 is the only portable compressor unit now made that employs the same slow-speed, heavy-duty, stationary-type compressor that is commonly used for permanent installations and that for this reason, it has a greater efficiency than comparable higher-speed portable compressors. The basic economy of this unit is claimed to be about 19.5 brake horsepower per 100 cu. ft. of free air actually delivered at 100 lb. discharge pressure.

The Model 425 is available with a semi-portable mounting on steel skids or with a fully-portable mounting with a drawbar and four steel wheels equipped with single tires in front and dual tires in the



The New Model 425 Will Deliver 425 Cu. Ft. of Air Per Minute at 100 Lb. Pressure

rear. An oil engine can also be installed in place of the gasoline engine for this compressor.

Improved B. & B. Machine and Grinder

A NUMBER of improvements have been made by the Mall Tool Company, Chicago, in its multi-purpose bridge and building machine, in its rail grinding machine and in the accessories for these machines. These improvements in general consist of an improved flexible shaft and changes in the design of the attachments to reduce weight or increase service life.

The bridge and building machine consists of a 3 hp., air-cooled, single cylinder gasoline engine mounted either on a wheebarrow-type frame with a rubber-tired pneumatic wheel, or on a frame with low, round steel base mountings. The power outlet is geared to a flexible shaft, which is available in 7, 14, 21 or 28 ft. lengths and to which, by means of a coupling collar, the numerous attachments for many types of bridge and building work can be fastened or removed quickly and easily.

The B. & B. Machine Has Many Uses In Timber Deck Work

The rail grinding machine is similar in construction, with a 5-hp. gasoline engine, and with retractible rollers and an outrigger and insulated roller, enabling this machine to be operated either on or off the track. The grinding attachments and attachments for other types of work are coupled to the end of the flexible shaft of this machine in the same manner as with the bridge and building machine.

The major improvements in these machines and their accessories include an improved flexible shaft consisting of high carbon, hard drawn, piano wire, wound solid to the center, which is now produced on a new machine specially designed for its manufacture, insuring a product of greater uniformity and longer life. In addition, the end fittings of the flexible shafts are swaged to the rubberized fabric housings to insure water tightness and prevent stretching. Improvements in the attachments include the use of roller bearings in the concrete vibrator head to increase the service life of this unit and the redesign of the gear housings of other attachments to use a new light alloy and reduce the weight of the attachments.

Several Improvements Have Been Made in the Rail Grinder

Elastic Roof Coating

THE Flexrock Company, Philadelphia, Pa., has developed a roof coating which is said to have a number of desirable characteristics, including long life, and to be adapted to application on roundhouses, shops and other railway buildings with low-pitched roofs. The new material, which has been named "Rooflex," is made up of Gilsonite, asbestos fibres, mineral asphalt and heavy non-evaporating oils. It is adapted especially for paper, felt, slag and composition roofs, although it can be applied equally well on corrugated iron, tin or croncrete roofs.

"Rooflex" is prepared in three forms; a primer, a liquid and a plastic. The primer contains no asbestos fibres and is designed to penetrate and rejuvenate old roofs. The liquid has a 5 per cent asbestos fibre content and is the finishing or mop coat, while the plastic contains 20 per cent asbestos and is said to be adapted particularly for patching and repairing existing roofs, although it may also form the basic material for new roofs.

The primer and the liquid are readily spread on by ordinary roofing brushes or mops, while the plastic can be easily trowelled on. As a result of the elasticity of "Rooflex," it is said to be adapted also for flashing and coping repairs. This same quality permits it to expand and contract with the roof without checking or cracking. In addition to these qualities, the material is said to have a sufficiently high melting point to prevent its sagging or flowing under the heat of the sun, and to be highly resistant to the effects of smoke and acid fumes in the atmosphere.

New Barco Portable Gasoline-Powered Drill

THE Barco Manufacturing Company, Chicago, has perfected a portable, self-powered driller known as the Barco J-2, which differs from other drilling equipment manufactured by this company in that the drilling swivel which was formerly applied as an accessory to the regular Barco hammer is now an integral part of the equipment, being incorporated in the base of the power unit.

The drill consists of an air-cooled, two cycle, single-cylinder gasoline engine, in which a spring-returned piston is propelled downward by the explosion in the combustion chamber,

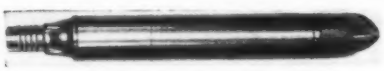
The Drilling Swivel Is An Integral Part of the New Barco Hammer

striking an anvil which transmits the blow to the drill rod. Lubrication is provided by mixing oil with the gasoline, and ignition by means of a dry cell battery. A ratchet wrench for turning the drill rod is standard equipment with the J-2, and a small portable air compressor unit with necessary storage tanks and fittings is also available for use with this drill to eliminate hand spooning or flushing of the hole.

It is claimed that the lightness of the J-2, its instant readiness for use under its own power, and its economical operation, adapts it to a wide variety of working conditions.

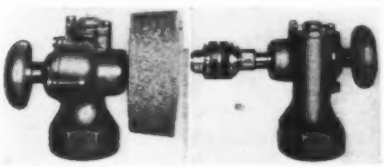
Improvements in Jackson Concrete Vibrator

THE Electric Tamper and Equipment Company, Ludington, Mich., has improved its Jackson HS-A1 Hydro-spade concrete vibrator to



The New Concrete Vibrator Head

increase its adaptability for concrete vibrating work and to permit the use of two accessories. This has been accomplished by the substitution of a new two-piece screw joint case for the older one-piece casing, permitting a quick change from the standard 2¾ in. vibrator head to a 1¾-in. by 36-in. vibrator head or



The New Auxiliary Head Fitted for Grinding and Boring

the attachment of a new hydraulic grinding and boring head.

The vibrator now consists of a hydraulic motor in the upper part of the seamless steel casing, and the detachable vibrating unit in the lower part. The motor is of the hydraulic displacement type, with interchangeable nitraloy parts and superspeed ball bearings. The vibrator has a double row ball bearing-mounted vibrating element and a chrome nickel point. The frequency of this unit is controlled, between 4000 and 7000 r.p.m., by opening or closing a by-pass valve on the power plant. The 1¾-in. vibrator head is designed for the vibration of concrete poured in thin sections or in work with closely spaced reinforcing.

The new hydraulic grinding and boring head, which has been developed for use with this machine, has an adjustable speed of 300-600 r.p.m., and a special aluminum alloy cast housing and cover. It can be fitted with coarse or fine grinding wheels or with a three-jaw chuck and screw shank for drilling. This attachment can be used for dry or wet rubbing of concrete or for drilling holes up to ⅝ in. in diameter in metal and 1½ in. in wood. All moving parts, with the exception of the power unit, operate in and are amply lubricated by the hydraulic medium which is a high grade, light bodied oil.

The power unit of the Jackson HS-A1 Hydro-Spade consists of a 3½ hp., gasoline engine or an electric motor, and a pump of the internal gear type which is mounted to and directly driven by the engine. This unit is mounted on a wheelbarrow type welded steel base and is connected to the vibrator by a flexible double hose line.

Moulded Plastic Joint Packing

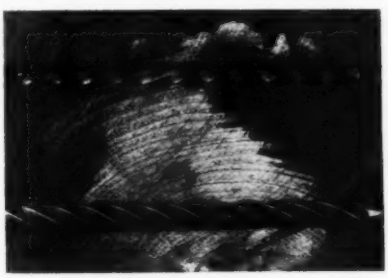
THE Rail Joint Company, New York, has developed a moulded plastic, which is a development of its R.M.C. Plastic in the form of blocks of suitable size for application around the bolts and between the angle bar and the rail, with new or re-formed angle bars used on either new or old rail. The plastic blocks are placed on the inner face of the angle bar prior to bolting up the joint. The bars are then fitted to the rail in the conventional manner and the bolts tightened, forcing the plastic into the entire space between the inside face of the angle bar and the web of the rail, around the bolts and between the bearing surfaces at the head and base of the joint bar.

R.M.C. Plastic has previously been applied to joints in the track by removing a center bolt and forcing the plastic into the space behind the bars at high pressure, to secure the benefits of its lubricating qualities, its scale penetration and absorption qualities, and its ability to prevent corrosion. It is said that the use of this plastic in packing joints increases the life of the joints by greatly reducing corrosion and joint wear, and eliminates frozen joints and track bolts.

Anti-Splitting Drive Dowels

THE Pittsburgh Screw and Bolt Corporation, Pittsburgh, Pa., has developed a drive dowel, known as the Giant-Grip, for application to ties or timbers before or after treatment to prevent splitting, or to ties in the track that have split to prevent further splitting.

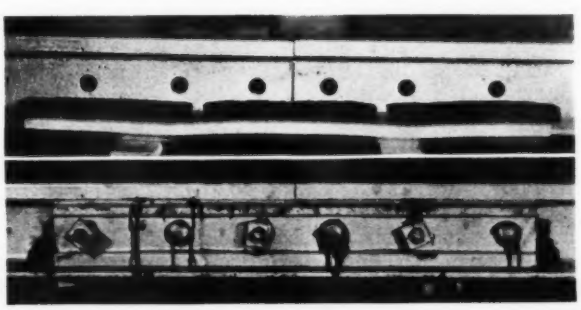
The Giant-Grip drive dowel is made from a ⅜ in. or ½ in. square



Cross Section of a Tie, Showing Drive Dowels in Place

bar twisted in a torsion machine to produce a suitable thread. One end of the dowel is cut square and the other end tapered bluntly. It is applied in a 5/16 in. pre-bored hole by driving with a sledge or other suitable means, such as a pneumatic or electric hammer.

The recommended practice of dowelling ties before treatment is to apply four dowels through each tie, two on each end, six inches from the ends and parallel to and 1½ in. from the top and bottom. The dowels may be applied to ties in the track by drill-



Top—Sections of the Moulded Plastic in Place Before Setting Up the Bars. Below—The Bars in Place

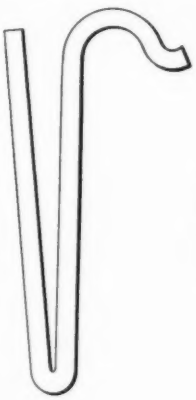
ing at a suitable angle to allow clearance for the tools and then driving the dowel in place. This may be done with or without using a clamp to close the split.

The effectiveness of the dowel is based on the fact that it cannot be turned in the tie. Neither side of the tie can move from the splitting opening without causing the other end of the dowel to rotate and the rotating tendencies produced by each side of the split are opposed. It is claimed that the dowels, in addition to being so firmly anchored as to prevent splitting, have enough strength to resist tensil strains and endure incident corrosion and that they will be effective throughout the life of the tie or timber.

The dowels are made in various lengths suitable for anti-splitting service in cross ties, switch ties and timbers of various dimensions.

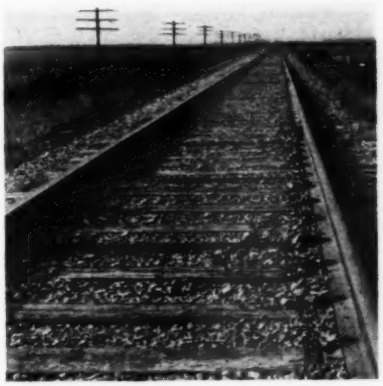
Develops New Spring Spike

AN entirely new principle in the design of track spikes is incorporated in a spring-type spike that has been developed by The Rails Company, New Haven, Conn. This spike consists of a length of heat-treated and tempered spring steel, rectangular in cross-section, which is suitably curved at one end to form a compression spring for bearing against the top of the rail base while the remainder of the piece is bent back on itself to form the shaft of the spike.



As Shown In This Drawing the Shaft of the Spike is Formed by Bending a Part of the Piece Back on Itself

Known as the compression rail spike, the new product is designed for use with standard single or double-shoulder tie plates, and is made of 5/16-in. by ⅝-in. stock for use with 11/16-in. spike holes and of 5/16-in. by 11/16-in. stock for use with ¾-in. holes. In each case the shaft of the spike is bent back on itself in such a manner that, prior to insertion, the two legs form a small angle and are separated at the upper end of the spike by a gap of ⅝ in. Thus, when the spike is driven through the spike hole in the tie plate the two legs forming the shaft are pressed together, narrowing the gap and thereby creating the holding power in the spike by building up pressure between the shaft of the spike and the sides of the spike hole in the tie plate.



An Installation of the New Compression Rail Spike

The compression spike may be inserted in old cut-spike holes in the ties provided they are deep enough; otherwise the existing holes are deepened with a ⅝-in. drill or in the case of new ties holes for the spike may be bored as part of the preframing process or bored in the field, using the tie plates as templates. In boring the holes they may be extended entirely through the tie to provide for drainage or bored only deep enough to receive the spike, in which event it is recommended that they be protected with a suitable preservative.

It is said that these spikes give equally satisfactory service when driven in the holes at the edge of the rail base or in the lag or anchor holes. To insure that they will have a uniform bearing on the rail base, a special technic is used in driving them. In this operation, the objective of which is to drive the spike ¼ in. farther after the first contact is made with the top of the base flange, the spike is driven down with a spike maul until the curved portion just touches the rail base, the driving blows being applied on the top of the uncurved leg or shaft of the compression spike.

From this point a spike maul or other suitable tool is used, the driving face of which is mortised to such a depth that when it is placed in position on the spike the driving face of the tool is ¼ in. from the top of the tie plate. Another maul is then used to drive the mortised tool down ¼ in. or until the driving face of the latter touches the top of the tie plate. When the spike is driven in this manner, it is said that the pressure exerted on the rail base amounts to approximately 2000 lb. A special tool has also been developed to facilitate the pulling of the new spike.

It is said that the compression spike holds the rail against creepage in either direction and also stiffens and strengthens the track structure generally. It is also pointed out that the spike may be applied in any number per panel that may be required to provide the desired restraint against movement of the rail. In general, however, it is recommended that they be applied in alternate ties under normal conditions and in every tie in locations where rail creepage presents a severe problem.

Three New Arc Welding Electrodes

THE General Electric Company, Schenectady, N. Y., has developed three new coated arc welding electrodes, W-20E, W-22E and W-23E, which are adapted particularly to the various classes of bridge welding work.

The W-20E electrode is suited for single or multiple-pass, shielded-arc welding of mild steel in vertical or overhead work, but it is claimed that it is suited particularly for high-speed, single-pass welding. This electrode can be used with alternating current, or with direct current (straight polarity).

The W-23E Electrode is Adapted Particularly to Bridge Floor and Other Downhand Work

The W-22E electrode is comparable in every respect to the W-20E, but it is designed specifically for use with direct current (reverse polarity). It is said that this electrode is fast-melting and smooth-flowing, whereby dense deposits can be made without gas pockets or slag inclusions, and that it is particu-

larly adapted for making horizontal fillets.

The W-23E electrode, which is designed especially for welding bridge flooring and other downhand work, is a high current or "hot" rod electrode and can be used with alternating current, or with direct current (reverse polarity). It is claimed that the weld metal of this electrode is quite fluid and washes up well on the side walls of deep-groove joints and fillets, and that single- or multiple-pass beads can be made at high speeds without slag inclusions or gas pockets.

The coating of all three electrodes is a hard flux, which it is said is not readily chipped or damaged by moisture. It is also claimed that through the use of any of these electrodes, splatter loss is low and the weld bead is smooth, and that the slag deposit is easily removed.

New Bethanized Wire Rope

A WIRE rope with a protective coating of electrolytically-deposited zinc has recently been made available by the Bethlehem Steel Company, Bethlehem, Pa. The coating process used is a distinct departure from the methods heretofore employed in galvanizing and has virtually resulted in the development of a new commodity suited for use with railroad work equipment, in railroad yards and roundhouses where a corrosive atmosphere prevails, in tunnels and on certain types of drawbridges.

In the bethanizing process the wire is drawn down to a predetermined size that is considerably larger than the gage desired in the finished product. It is then passed through an electrolytic bath to produce a zinc coating of a thickness which can be regulated accurately. Next the wire is drawn to the required gage and fabricated into wire rope.

In the older methods, the wire is cold drawn to the final size, galvanized by the hot dip method and fabricated into rope. In this method the wire is subjected to a temperature of about 900 deg. F. in the galvanizing kettle, which affects its physical properties, whereas in the bethanizing process the temperature of the electrolytic cells is only slightly above room temperature.

It is stated that, owing to the high ductility of the electro-deposited zinc and its firm adherence to the steel in the bethanizing process, both the final drawing and the fabrication of the wire rope can be carried out without damage to the coating. In addition, all the benefits derived from the redrawing operation are retained so that the finished wire has the full physical properties found in regular bright wire ordinarily used in the manufacture of wire rope.

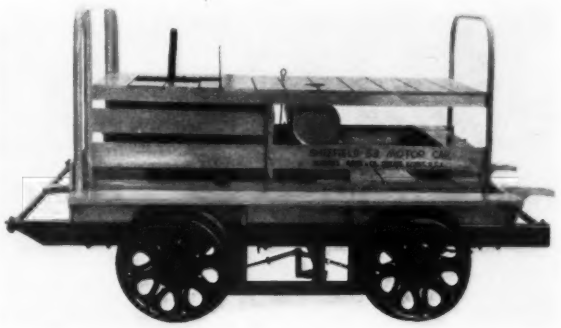
Fairbanks, Morse Offers Six New Cars

TWO lightweight standard section cars, and four models of 1 to 4-man inspection cars have been added to the Fairbanks, Morse line of Sheffield and Eclipse motor cars, so that this company's section cars are now available with either belt drive or clutch and roller chain drive, and the inspection cars with either type of drive and with either water-cooled or air-cooled engines. Throughout all of these models the fundamental features of design have been predicted upon providing sturdy, roomy cars, with minimum weight and maximum hauling capacity.

The new section cars, designated as the Sheffield No. 53 and the Eclipse No. 709, are similar in size, design and power plant, except that the former has a clutch and roller chain drive while the latter has an idler belt drive. These models have sturdy steel channel chasses; two-piece differential front axles; double Timken tapered roller-bearing axle mountings in all-steel welded axle boxes; roomy bodies, seats and tool trays; extension handles and electric-welded, one-piece wheels.

The engines in both section models are of the horizontal, single-cylinder, two-cycle, reversible type, and are the same, except for the few changes necessary to adapt them to the chain or belt drive. They have a 4¾-in. bore and a 4¾-in. stroke, develop 8 to 13 hp., depending upon the speed, and are said to have unusually high starting torque and smooth running qualities. Other features of the engines are their water-cooled cylinder with air-cooled head, and their high carbon, heat-treated steel crankshaft. The belt drive of the Eclipse 709 is similar to that furnished in other Sheffield and Eclipse cars, while the newer chain drive of the Sheffield 53 is said to incorporate a specially designed clutch that cannot be burned out in operation, regardless of how long it is slipped or how quickly or slowly it is applied.

Both the No. 53 and the No. 709 have an overall length of 88 in.; an overall width of 63-11/16 in. and a wheel base of 37 in. The No. 53 weighs 929 lb., with a rear lifting weight of 124½ lb., while the No. 709 weighs 930 lb., with a rear lifting weight of 129½ lb.

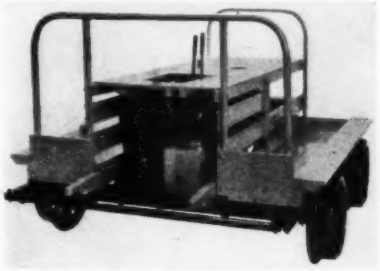


The New Sheffield No. 53 Lightweight Standard Section Motor Car

The four new one to four-man

The New Eclipse No. 784, One to Four-Man Inspection Car

inspection cars, the Sheffield 54 and 84 and the Eclipse 754 and 784, are similar in chassis and body, incorporating sturdy construction with light weight, and differ principally in their power plant and type of drive. Both the No. 54 and 754 cars have water-cooled engines, but the former has a clutch and roller chain drive, while the latter has a belt drive. Both the No. 84 and No. 784 models, on the other hand, have air-cooled engines, the former being equipped with the chain drive, while the latter has a belt drive. The engines in all four models are of the horizontal, single-cylinder, two-cycle, two-port, reversible type, and all have a 3¾-in. bore, a 3½-in.



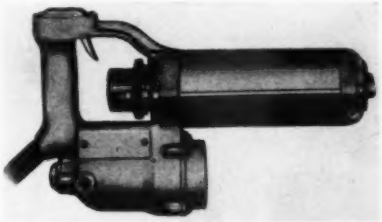
The New Eclipse No. 709 Lightweight Standard Section Car

stroke, and develop 5 to 8 hp. The water-cooled engine incorporates all of the desirable features of the larger capacity water-cooled engines of the Sheffield line. In the air-cooled engine, a large capacity blower, incorporated in the flywheel and completely housed as a safety feature, delivers a cooling air blast to the cooling fins of the cylinders.

All four new inspection models weigh within the range of 620 to 630 lb. and the heaviest of them is said to have a rear lifting weight on extension handles of less than 100 lb.

Syntron Heavy-Duty Electric Hammer

THE Syntron Company, Homer City, Pa., has developed a new electric hammer that is designed primarily for heavy drilling and cutting work in concrete, masonry, etc. The new hammer, which is known as the No. 25 hammer and is the most powerful electric hammer yet developed by this company is built similar to the other models, with two electro-magnets wound around a barrel in which a free-moving, heavy piston strikes directly on the shank of the tool being used. The No. 25 hammer is 16 in. long overall, 3½ in. in diameter and weighs only 25 lbs. It is stated that the installation of a high-speed blower motor in the handle keeps the magnet windings



The No. 25 Heavy-Duty Electric Hammer

cool and makes possible the construction of such a powerful hammer with a weight of only 25 lbs.

Emergency Carbide Light

A NEW emergency carbide light embodying a number of advantageous features has been placed on the market by the Hunter Manufacturing Corporation, New York. An important feature of this light, which is known as the Rex Emergency Light, is a special built-in valve which controls the flow of water to the carbide, thereby permitting generation of only enough gas to maintain an even light during the entire burning period. Largely due to this feature it is said that this light burns steadily for 2½ hours or more with a 250 to 350-candle power radiance. Also it is

The New Light Is Said to Burn Steadily for 2½ Hr. or More

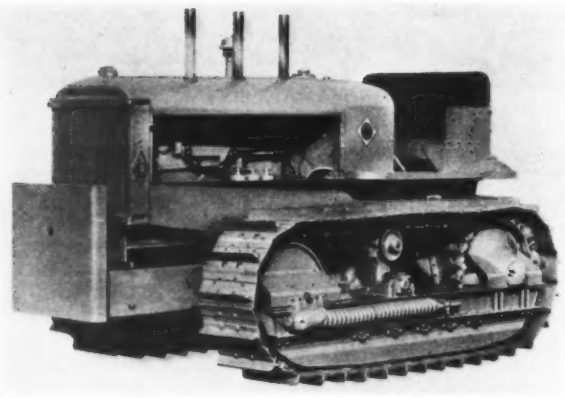
pointed out that the valve prevents the building up of high internal pressures during the burning period of the light, thereby precluding the danger of explosion.

The Rex Emergency Light is embodied in a cylindrical sheet metal container with the burner at the top and an opening in the bottom to permit water to enter. The special valve is in the form of a copper tube, and is fastened to the bottom on the interior in a vertical position in such a manner that it is surrounded by the carbide. At regular intervals the tube is provided with holes for permitting the flow of water into the carbide chamber. When in operation, the container is placed in water having a depth of about 14 in. and as water enters the tubular valve through the bottom of the container it escapes through the holes and comes in contact with the carbide. As the latter gives up its gas the container gradually sinks deeper into the water, thereby causing water to be admitted to the carbide through the hole at the next higher level. The holes are said to be of the size and spacing that will produce a light of constant candle power with a minimum loss of gas. A perforated sheet-metal sleeve surrounding the valve prevents the carbide from clogging the water holes.

Another feature of the light is the carbide retainer, an umbrella-shaped disc placed in the container at the top of the valve, which holds the carbide in place and prevents it from shifting about, thereby preserving it against damage. The top of the container embodying the light is so shaped as to provide a recess that deflects the wind upward from the light, preventing it from being blown out. Also a baffle is placed just below the burner and is said to prevent the flame from sputtering by causing precipitation of any moisture that may be held in suspension. It is pointed out that the light will operate in a bucket of water, in a hole in the ground filled with water or that it will float and burn in a stream or ditch containing water. It is said that the light will remain in an upright position in the water and that no attention is required for its operation.

Allis-Chalmers Pusher Attachment for Tractors

A NEW front end bumper has been designed by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., for its Model L-O tractors to be used for pushing tractor-scraper outfits while loading. The bumper, which is spring cushioned, is mounted inside the tractor frame in such a manner that the push on the bumper is transmitted to the rear end of the tractor. The bumper, which has a face 36 in. by 32 in., permits easy contact with the scraper bumper, and can be used for the loading of any large capacity scraper equipped with a rear bumper. One pusher tractor can handle three to five tractors and scrapers, depending on the haul.



Tractor Equipped with Bumper for Pusher Service

It is claimed the use of a pusher tractor increases each load two or three cubic yards while at the same time reducing materially the loading time, so that daily output per scraper is increased 33 to 50 per cent. It is also stated that the use of a pusher tractor materially reduces repair costs by relieving the pulling tractors of a large part of the customary jerking and twisting strains when loading, and that operator fatigue is consequently reduced by the less gear shifting and steering clutch work.

New Spring Washer and Spring Lock

THE Eaton Manufacturing Company, Reliance Spring Washer Division, Massillon, Ohio, has added two new designs to its line of rail joint spring reactance devices which are intended to provide the protection against rail joint looseness demanded by the higher speeds and increased axle loads of present-day freight and passenger trains. The new devices, designated the Double Hy-Crome spring washer and the Hy-Crome Springlock, are designed specifically to meet the increased joint stresses set up by this traffic, to provide the additional reactive pressure required over an adequate range to maintain correct bolt tension and to compensate for the inevitable wear in bolted joints subject to such traffic. Both laboratory and field tests are said to substantiate these claims.

The Double Hy-Crome spring washer, in addition to providing the necessary reactance pressure and pressure range to meet the conditions of the heaviest traffic, also affords the necessary resiliency under compression to prevent a frozen condition of the joint assembly. Its construction does not require any increased bolt length for its use.

The Hy-Crome Springlock differs in design and construction from the conventional spring washer, as is evident in the accompanying illustration.

The New Double Hy-Crome Spring Washer

Views of the New Hy-Crome Springlock

In addition to providing the required reactive pressure over a considerable range, making it comparable to the Double Hy-Crome spring washer in compensating for joint wear while providing the necessary resilience in the joint, it also provides definite locking features, which are claimed to prevent the backing off of the nut. Like the Double Hy-Crome unit, the free height of the Springlock is such that its use does not require a bolt of extra length. Under wrenching action, Springlock-equipped nuts can be backed off, and it is said that this can be done without destroying the bearing surfaces of the nuts.

Both of the new designs are the result of extended research work and laboratory tests to develop the most effective shape and to determine the correct cross sections of metal for various reactive pressures and bolt sizes. Special laboratory and testing equipment was built as an aid in this regard and to determine the non-fatiguing ability of the designs, and other equipment was employed to determine their pressure ranges accurately, this being in line with a general extension of the research and laboratory facilities of the company during the last year to insure the highest quality of its products.

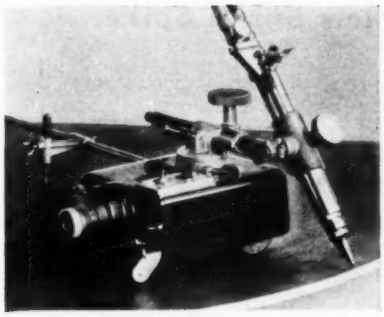
Airco Develops New Radiagraph

THE Air Reduction Sales Company, New York, has added a new unit, known as the Airco—DB No. 10 Radiagraph, to its line of gas cutting machines. The new unit is somewhat similar to this company's No. 4 Radiagraph but is smaller and lighter, weighing only 41 lb. It is pointed out that it can be used to advantage in any shop where steel sheets, plates, billets and forgings are cut for welded fabrication or beveled for gas or electric welding.

For making straight cuts with either square or beveled edges, the No. 10 Radiagraph runs on a lightweight steel track, one section of track for making cuts up to 5 ft. in length being standard equipment with each machine. For cutting in arcs or circles it is equipped with a detachable radius rod and center point which are standard equipment. With this equipment circles ranging from 3 in. to 85 in. in diameter can be cut.

The No. 10 Radiagraph is driven by a variable speed motor and may be operated in either direction. The cutting speed ranges from 4 to 60 in. per minute and the unit can be set to operate at any desired speed between these limits by adjustment of the indexed speed control that is located at one end of the carriage. Also conveniently grouped on top of the machine are the starting and stopping switch, the forward and reversing switch and the lever for disengaging the transmission gears for freewheeling. The latter feature allows the machine to be rolled freely in either direction.

Torch adjustments that are provided by the torch holder assembly include: (1) Rotation around the



The New Airco—DB No. 10 Radiagraph

mounting part; (2) lateral movement; (3) vertical movement; and (4) angular adjustment for bevel cutting. The new unit operates on 110-volt a.c. or d.c. current, and a three-conductor line cord 25 ft. long is supplied with each machine.

Improve Floor and Pavement Resurfacer

BY the addition of a compound known as Montmorillonite, composed principally of manganese, silica, alumina and iron, the Flexrock Company, Philadelphia, Pa., has improved its Ruggedwear Resurfacer, which is used for the repair of worn or uneven surfaces of concrete and for the repair of floors in general.

Ruggedwear Resurfacer is applied in a powder form, is mixed with cement, sand and water and is applied with a trowel. It may be applied in thicknesses varying from a feather-edge to one inch or more in depth and sets quickly to form a floor surface, which, it is said, is hard and durable and will withstand heavy loads without marring or cracking. In repairing road crossings with this material the application of the Resurfacer against the sides and base of the rail is said to dampen the rail vibrations caused by traffic and increase the service life of the crossing in addition to improving the surface.

It is stated that the addition of Montmorillonite to this compound makes it mix easier with cement, sand and stone, increases the toughness of Ruggedwear, making it better for feather-edge concrete repairs which will withstand severe service, and increases the coverage capacity per pound of this product.

New Templeton, Kenly Simplex Screw-Jack

A NEW line of Simplex screw-jacks, available in 38 sizes, featuring a malleable iron base and a floating cap supported on a chrome-molybdenum ball, has been announced by Templeton, Kenly & Company, Chicago. The new jacks consist of a solid one-piece base of malleable iron, with a peep hole through the base to enable the operator to see how far the screw can be safely run out; a one-piece drop-forged steel screw with smooth machine cut threads of correct pitch, depth and thickness; and a drop-forged steel head surmounted by a floating cap resting on a chrome-molybdenum steel ball.

The Simplex Screw Jack with Cut-away View of the Head Showing Chrome-Molybdenum Ball and Floating Cap

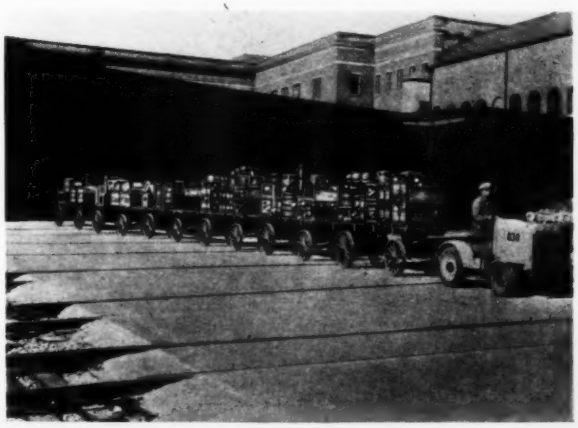
The cap is fastened to the head by a pin which allows it to rotate and tilt 9 deg. in any direction. A hole in the cap permits oiling of the chrome-molydenum steel ball. Former models of Simplex screw-jacks had a large elliptical hole in the side of the base under the handle for observing the position of the screw, but in the new jacks the peep hole is smaller and located on the side 90 deg. from the handle. It is claimed that the new floating cap with its 9 deg. tilt completely centers the load, reduces friction 88 per cent, and eliminates the possibility and danger of the jack twisting under a heavy load.

Improvements in Power Track Cribbing Machine

THE Power Ballaster Company, Chicago, has added a mechanical lift and right angle power drive to its power track cribbing machine so that this machine, which weighs about 14 tons, can now be removed from the track in approximately three minutes. The improvement consists of four power jacks permanently attached to the corners of the machine, and a direct drive connected to the four transversely-operating wheels. In removing the machine from the track, the operator raises the machine sufficiently with the power jacks to place two set-off rails transversely on the track rails under the transversely-operating wheels of the machine. The set-off rails lead to a crib set-off and the operator moves the machine with its own power off the track onto the set-off.

This machine, which was described in *Railway Engineering and Maintenance* for March, 1934, operates on the principle of a drop hammer, with a heavy crosshead member extending the full length of the tie. This crosshead operates in vertical guides and drops over each crib. Digger bars or arms mounted on the crosshead operate transversely to the track in each crib.

Considerable operating economies are claimed by the use of this machine, as compared to the cost of cribbing track with hand labor. A record of the operation of five of these machines in 1938, during which time they were employed on 109 jobs varying from 0.1 to 6.46 miles of cribbing and comprising a total of 636,273 track feet, is said to have reduced costs over 50 per cent, de-



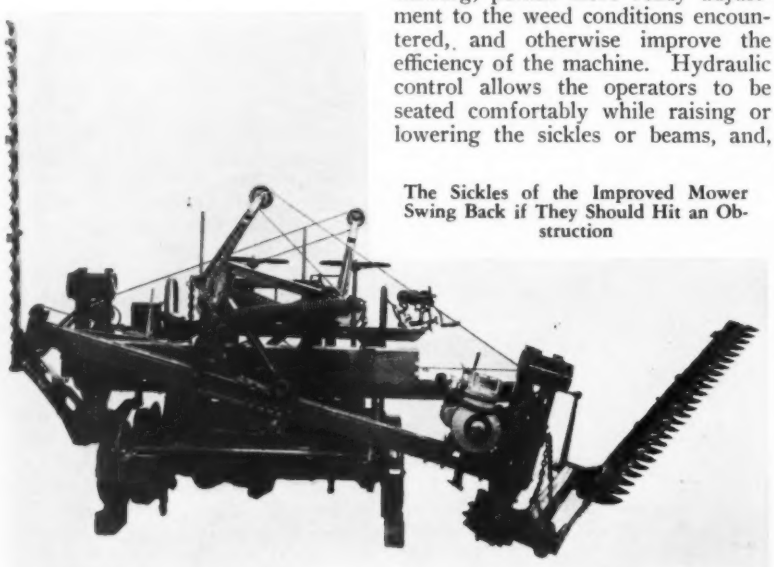
Grade Crossing at a Station Completely Resurfaced With Ruggedwear

Rear View of Power Ballaster Machine

spite the fact that delays to machine operation because of traffic were as high as 30 per cent of the total time worked in some cases, and averaged 20 per cent during the year.

Fairmont Improves Its Weed Mower

SEVERAL important improvements have been incorporated in the heavy-duty, high-speed Fairmont M24, Series E weed mower, which make weed cutting with this unit safer, faster and more economical. This unit, which is equipped with two power-driven sickles, each supported on an extension tilting beam to permit mowing at varying distances on both sides of the track and at varying levels, can now mow from within a few inches of the rail to a distance of 14 ft. 8 in. from the center of the track.



The Sickles of the Improved Mower Swing Back if They Should Hit an Obstruction

The outstanding new feature of the mower is the incorporation of a release on each mowing unit, which frees the sickle from its position at right angles to the track if it should hit an obstruction and permits it to swing backward to clear the obstruction, thereby preventing damage to the sickle or other parts of the mechanism. This release, which consists of a steel snap located at the lower power head of the sickle-driving engine, actually assists in pivoting the sickle backward and away from obstructions, and then, when the obstruction has been passed, the sickle resumes its original cutting position. This entire action takes place automatically without stopping the car and without the aid of either operator.

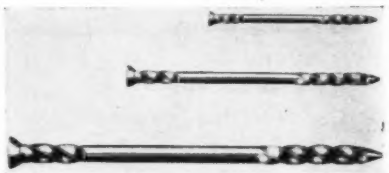
Another important improvement in the mower is the provision of a twin-disc clutch for the two heavy-duty, air-cooled, Wisconsin engines which drive the sickles, so that the engine can be operated entirely independent of the cutter bar. This permits more easy starting of the engine, since it can warm up without the drag of the entire sickle and, at the same time, allows the sickle to be adjusted while the motor is running, without danger to the one making the adjustments.

Improvements have also been made in the control mechanisms of the mower, which increase the speed of mowing, permit more ready adjustment to the weed conditions encountered, and otherwise improve the efficiency of the machine. Hydraulic control allows the operators to be seated comfortably while raising or lowering the sickles or beams, and, through a large hand wheel that turns with little effort, the tilting beams can be readily moved inward or outward to best meet weed conditions. A foot lever locks each beam at three-inch intervals.

A new auxiliary offered for use with the mower is a hydraulic turntable, which makes it possible to take the unit off the track where there is no road crossing.

New Spiral Spike

THE Pittsburgh Screw and Bolt Corporation, Pittsburgh, Pa., has developed a Double Grip spike for wood or timber construction work that is claimed to be greatly superior to the ordinary smooth shafted spike or nail. The spike is designed with a spiral neck and foot, the mid-section being left smooth to facilitate both driving and removal, if necessary, and with a heavy tapered head that will withstand driving pressure without turning as the result of a misplaced blow. The spiral design at the end and under the head of the spike has a double locking effect since a tendency to pull apart of two planks or timbers nailed together with this spike produces an opposed torsional force on the two ends of the spike, giving it a remarkable gripping and holding power. The spikes are made in various diameters and lengths to suit every practical purpose.



A View of Three Sizes of the New Spiral Spikes

New Drill for Concrete and Masonry

THE Carboloy Company, Inc., Detroit, Mich., has developed a drill, known as the Carboloy Flat Drill, that is adapted specially for drilling masonry, concrete, slate, tile, brick, marble, and other similar materials commonly encountered in such maintenance work as the installation of wiring, piping, anchors, brackets, machinery and fencing. This drill

This View Shows the Design of the New Carboloy Flat Drill

contains a cutting edge made of Carboloy cemented carbide, which is said to be harder than the hardest steel, closely approaching the hardness of diamonds. It is claimed that this drill will drill holes in concrete or similar materials 50 per cent faster than drills commonly employed, that it will hold a sharp cutting edge for long periods of use, that it will produce smoother, more accurate holes and that it will eliminate the difficulties ordinarily encountered when drilling glazed surfaces such as on tile.

Extension Handle for Spray Painting

A NEW type of extension handle has been developed by the DeVilbiss Company, Toledo, Ohio, which is designed to combine the convenience of an extension gun in many classes of railroad painting with the higher quality of work done by this company's heavy-duty high-speed MBC gun. It is adapted particularly to painting walls, ceilings, truss work or freight cars and locomotives and saves the expense of erecting scaffolding or the time and labor of moving and climbing ladders.

The extension, which is light in weight and properly balanced, is constructed of air and fluid tubes, rigidly held by clamps and soldered into a strong casting at the inlet end. The extension trigger, which is attached to this casting, operates the gun by a simple ball crank system, and is located to make operation as simple as with the gun itself. The nozzle of the gun is tilted at a 40-deg. angle from the line of the handle. This facilitates spray-coating of walls, ceilings, structural work and maintenance jobs which are difficult with a gun alone.

The Extension Handle for Spray Painting

Consolidated Exhibit

The Committee for the Consolidation of Railway Supply Associations, composed of representatives of the National Railway Appliances Association, the Track Supply Association and the Bridge and Building Supply Men's Association, adopted a resolution outlining its aims and objectives at a meeting in Chicago on January 26. This committee is composed of E. D. Cowlin, chairman, Eaton Manufacturing Company, and H. H. Talboys, Nordberg Manufacturing Company, representing the N.R.A.A.; E. C. Argust, Morden Frog & Crossing Works and R. J. McComb, Woodings-Verona Tool Works, representing the Track Supply Association; and W. S. Carlisle, National Lead Company, and G. R. McVay, Ruberoid Company, representing the Bridge and Building Supply Men's Association. The resolution follows:

WHEREAS, the attention of officers of several of the railway supply men's associations has been called to the fact, by manufacturers of supplies and railroad officers, that duplication of effort and needless expense exists in exhibiting their products and appliances to overlapping aggregations of railway associations, and that in the interest of greater efficiency, a wider showing to potential users and a broader educational spread to more of the railroad men could be effected by a consolidated exhibit that would show during a concurrent convention period which would include participation by elect groups of the railroad associations and affiliated supply men's associations who now meet separately in convention.

AND WHEREAS, it is declared by the association that the committee recognizes the scientific and social value of the several railway groups to the personnel of their respective memberships, and in no way does the Committee for Consolidation of Railway Supply Associations elect to have the specific organizations lose their identity or functional operations.

AND WHEREAS, the committee desires to meet the demand of the manufacturers of railroad equipment to exhibit to a larger number of men through a consolidated exhibit at one time and place, as opposed to the plan of exhibiting at a number of conventions necessitating a selection of one or more of these conventions for exhibition purposes, thereby depriving other groups of railroad men of the educational value that could be obtained by one consolidated exhibit on a larger and more extensive scale, provided that conventions of participating engineering associations would co-operate and hold their meetings concurrently at some agreed upon time and place.

AND WHEREAS, the possibilities of a consolidated association composed of all the groups serving as a clearing house for the dissemination of knowledge of mutual interests to all of the groups is apparent.

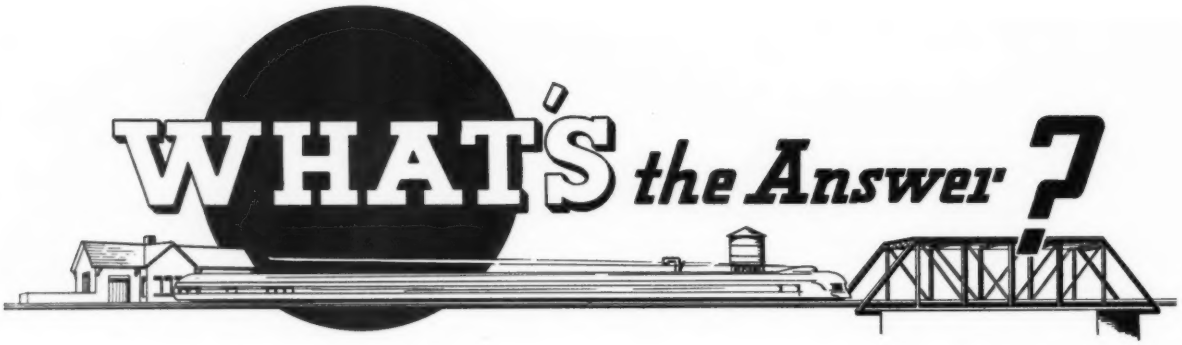
THEREFORE, be it resolved that the aims and objectives of the organization, in regular session of the Committee for Consolidation of Railway Supply Associations, are to wit:

FIRST: To effect an organization composed of representatives selected by the various railway engineering groups and railway supply men's associations who have a common interest and who shall elect to be members of the organization through voluntary expression of their membership body, each associate membership organization to be represented by an officer who shall be vice-president of the organization, thereby insuring the continuity and identity of the respective organizations represented, said vice-presidents to be in charge of all individual activities of groups respectively represented.

SECOND: To study ways and means to adopt a more efficient, extensive and broader plan to exhibit railroad devices, wares, equipment, etc., to a larger number of railroad men through some agreed upon plan to hold the participating member organization's meetings concurrently at a place and time to be agreed upon.

THIRD: That the above tenents of the resolution shall be considered the basic objective, but if in the judgment or the election of joint resolutions from the membership bodies, conditions and exigencies that may arise, demand adaptation and amendments, the association reserves the right to adopt by vote any such amendments or additions to the above adopted tenents.

Several associations of railway men have appointed representatives to join with the Committee for Consolidation of Railway Supply Associations and it is expected that the two groups will meet in the near future to map a program of activity in the interest of the supply manufacturers and the railway organizations.



Protection Against Wave Action

What practical methods can be employed to protect embankments from wave action during periods of high water?

Several Problems

By G. M. O'Rourke
District Engineer, Illinois Central, Chicago

Wave action is only one of the problems associated with high water, for scour by swift currents and saturation and softening of the material in the embankment are often as troublesome as wave action. Yet wave action may occur at places where there is no current and where least expected. If the trouble occurs frequently the protection should be permanent in character, and this can be provided best, depending on conditions, by flattening the slope, by sodding, by growing fibrous rooted vines, by planting trees such as black locust or willows, by riprap or by widening the embankment with furnace slag or hard shale.

In some cases, especially where erosion and scour are likely to occur, the riprap should be heavy derrick-size stone; in others, one-man size will be satisfactory and in still others the riprap facing or revetment should be laid with a smooth surface and grouted.

Trouble from wave action sometimes occurs at points where this form of damage has previously been unknown. Where the material is available, temporary protection can be provided by means of splash boards, consisting of old ties, bridge timbers, planking, grain doors, etc., held in place by wiring to stakes. Sand bags placed both below and above the water line are also effective. In the absence of any of these materials, brush or tree tops, either placed loosely and anchored or tied in bundles and placed continuously far enough off shore, will break the waves so that they will not erode the embankment.

If the embankment lies along the shore of a lake or a good-sized pond the waves are likely to be higher and the action more violent. Here the protection should be either riprap or a pile bulkhead of creosoted material. In more exposed situations it may be necessary to drive two lines of piles and fill between with heavy stone.

Complete Protection Best

By L. L. Adams
Engineer Maintenance of Way, Louisville & Nashville, Louisville, Ky.

Where an embankment is subjected to continuous or frequent wave action it becomes necessary to provide permanent and complete protection as the only means of assuring stability. The means most generally accepted for doing this is to give the embankment as flat a slope as practicable and then place riprap over the portion that is exposed to wave action. Better protection will be obtained and the construction will be more permanent if the riprap is placed carefully and then grouted. When suitable material is available, the embankment can be protected by widening it with rock or shale.

Where an embankment is subject to wave action only periodically or occasionally, and then for only a short time, if the climate and soil permit, ample protection can be obtained by inducing a heavy growth of some variety of deep-rooted vegetation, preferably some vine that has a heavy foliage. Willows planted at the toe of the embankment will also provide protection by breaking the waves before they strike the embankment. Locust trees planted a sufficient distance down the slope so that they will not interfere with the track or obstruct the view, will also furnish good protection.

In the event of unexpected high

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in May

1. *What causes the ballast on ballast-deck bridges to churn? How can this be overcome?*
2. *What practical methods and equipment can be employed to clean windows in the sides and monitors of enginehouses and shops?*
3. *Is there any difference in the service life of ties cut in the winter and in the summer? Why?*
4. *Where a single pile in a bent fails should it be spliced or replaced? If two piles fail? If more than two? Why? How should the work be done? Does the type of trestle make any difference?*
5. *When laying rail, should the spiking or the tightening of the bolts be done first? Why?*
6. *What practical methods can be employed to protect underground pipe lines against corrosion?*
7. *When lining track, what distance between center stakes is most desirable on curves? On tangents? Why? Should these stakes be permanent? Why?*
8. *What are the causes of fading and spotting of new paint where the old paint has been burned and scraped from wood surfaces? How can it be prevented?*

water where protection has not been provided, sand bags or brush held down by woven wire will provide temporary protection. Emergency measures of this kind will often save an embankment from serious damage.

Depends on Conditions

By A. B. Chaney
District Engineer, Missouri Pacific, Little Rock, Ark.

The method to be used to protect embankments from the effect of wave action during high water depends on whether the protection is to be permanent or temporary and on the availability of material suitable for the purpose. Permanent protection includes sodding, the planting of other suitable vegetation on the slopes, the flattening of slopes, and the placing of riprap or other revetment.

The presence of timber or heavy undergrowth along or near the embankment reduces damage from wave action. For temporary protection, the use of bags filled with sand or gravel, placed on the slope either just above or below the water line, is most effective and is a common method.

Other measures include the use of riprap; in the absence of other material, tree tops and branches anchored off shore will reduce the height of waves. The use of wash boards, burlap and similar material are effective but they are seldom used because of the large amount of time required to assemble the materials and forces necessary to apply them.

Recommends Riprap

By W. E. Folks
Track Supervisor, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio

Where wave action may be expected to recur at times of high water, permanent protection in the form of riprap of one-man size, placed from three to five feet above and below the normal high-water elevation, is recommended. Experience has shown that embankments reached by high water are damaged more often by wave action than by current erosion. Probably, in the majority of cases along the larger streams, only back water reaches the embankment, although there are plenty of cases where side wash creates almost all of the damage.

Where the back water is unusually high, and where permanent protection has not been provided, temporary protection can be afforded by anchoring ties, piles, telegraph poles, second-hand bridge timbers or even planks in a continuous line to act as splash boards. This form of protection is surprisingly effective for breaking waves of the height and violence usually encountered in flood back waters.

Paint Failures on Brick

What causes paint to fail on brick surfaces? What form of failure is most common? How can the trouble be overcome?

Moisture Usually Present

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

Paint failures on brick surfaces usually result from the same causes as similar failures on wood, such as dampness of the surface or the collection of moisture behind the film, causing the paint to blister or peel. Application of the second or third coat or both before the preceding coat has been given time to dry will cause the paint to check or alligator on brick the same as on wood. Improperly mixed paint or paint of inferior quality will sometimes dry too hard and crack, while films that are too thick do not dry evenly and are quite likely to wrinkle.

Blistering and peeling are the commonest forms of paint failures on brick surfaces. Entrance of moisture beneath the paint film should be guarded against, especially where heavy frosts or sudden or extreme changes in temperature are likely to occur. Frequent freezing and thawing of moisture in the bricks will soon loosen the paint or cause the brick to spall, taking the paint with it.

If a brick wall projects above a roof, it should be waterproofed or adequately protected with flashing, and equipped with a suitable coping to prevent moisture from entering the wall. Interior painting on brick walls is affected in much the same way as exterior surfaces, and in addition by temperature changes which cause the wall to sweat. This is more likely to happen if the wall is constructed of soft and porous brick that allows the moisture to seep through from the outside. If the wall is built of hard face brick that does not absorb moisture readily, this trouble is not so noticeable.

New brickwork should not be painted until it has dried thoroughly. When painting an old wall that has not been painted previously, the surface should be brushed with a stiff fibre brush to remove all loose particles. All loose mortar should be removed and the joints repointed where necessary. When a brick surface is to be repainted the same precautions should be observed as when repainting a wood surface, that is, all loose and scaling paint should be removed and chalking surfaces brushed. One should make sure that the surface is dry and free from dust, dirt, grease and other foreign substances; that the workmanship of application is up to standard; and that the materials are satisfactory with respect to quality.

In general, the reasons for painting brick surfaces are the same as for wood surfaces, namely, the preservation of the surface or for appearance. However, the necessity for preserving brick surfaces is rarely so urgent as for wood, since the rate of deterioration of a hard face brick is practically negligible. On the other hand, it often becomes desirable to improve appearance by brightening the surface with paint; or to blend the building with others in the vicinity. In any event, the same general principles for painting apply in the case of both brick and wood surfaces and the same general causes bring about failures.

Have Brick Dry

By Master Painter

While paint on brick surfaces will fail from about the same causes as on wood, the most common cause is moisture in the brick. All brick absorbs water, the capacity for absorption depending on the porosity of the brick. Thus a hard-burned shale brick will absorb only a small amount while a soft, porous brick will absorb a great deal. Normally, the rate of absorption is relatively high, while even under the most favorable natural conditions the brick dries slowly. In many cases, the surface will seem to be dry while the body of the brick still retains considerable moisture that may give trouble after the paint is applied. For this reason, it is highly important to know that the brick in the wall is thoroughly dry before the paint is applied.

Before applying the paint, the en-

tire surface should be brushed to remove all loose material, and all joints should be pointed and allowed to dry. The priming coat should be rich in oil, particularly if the brick is soft and porous. This coat should consist of nothing but white lead and oil. Allow the priming coat to dry hard, then apply the second coat, also using white lead and sufficient tint to bring this coat to the same color as the finishing coat. When this is dried apply the third coat, mixed exactly like the second coat. This paint should be highly resistant to moisture so that if water is not permitted to get into the wall from behind, the paint should have a satisfactory life.

Specialized Tie Gangs

What advantages, if any, are there in concentrating the renewal of ties in gangs organized and equipped specifically for that purpose? What disadvantages?

May Have Merit

By J. P. Datesman
Roadmaster, Chicago & North Western, Council Bluffs, Iowa

Large gangs seem to work out to better advantage than small gangs in yards. In recent years yard tracks have been allowed to go without the customary renewals. For this reason, too much work is involved in the renewal of the ties for the ordinary section gang to handle to advantage. A gang of 25 to 30 men, when given a clear yard track, can distribute and install the new ties; surface, line and dress the track, giving it about a 4-in lift; and pick up and dispose of the old ties, at the rate of 300 to 350 ties a day. I have found that such a gang will reduce the cost by as much as 50 per cent, compared with the smaller, average-size section gang.

Whether the specialized gang is of equal advantage for main-track renewals is a matter of long-standing debate. Personally, I do not believe that the results obtained from such gangs compare favorably with those of similar work by the regular section forces. Obviously, large tie gangs will be used only on districts requiring relatively heavy tie renewals. Track having poor ties is generally out of line, surface and gage. For this reason, it is usually necessary to gage the track out of face in connection with the renewals, and to surface and line it after the ties are placed.

Owing to the constant pressure for production, gangs of this type are always crowded to get more work done, so that, even with close supervision, there is a tendency for them to leave the track rough because of poor tamping, although the remainder of the work may be up to standard. It usually becomes necessary, therefore, to follow with the regular section forces to pick up and put the track in good condition for smooth riding. I have found that when the cost of the work done by the section gang is added to that of the tie gang, the total is greater than if the whole job had been handled by the regular section force.

If the track is to be ballasted, the large gang is best, for it can install the ties, lift the track, surface, line and dress the ballast at much lower cost than is possible with the small section gang. Yet it is always necessary to follow with a smaller force to pick up low spots caused by unequal settlement or lack of uniformity in the tamping. It is my settled opinion that no matter how well a large gang is organized, equipped and supervised, we must always look to the regular section forces to do the finished work that makes smooth-riding track.

Does Not Favor

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

Treated ties began to be used about 30 years too soon for there to be any advantage in organizing and equipping special tie gangs at this time. In other words, tie renewals have now been reduced to such a low figure per mile that economies cannot be effected through the use of special gangs. Furthermore, the renewal of ties in high-speed or dense-traffic lines has become an art, in which a competent foreman with trained men can spot in ties in any kind of ballast with no disturbance to the track structure and with no interference with traffic. Such a foreman will watch carefully and supervise the installation of every tie, but this minute care cannot be given by the foreman of a large gang.

It is probable that there are light-traffic branches and possibly some main lines where the tie renewals are heavy enough to justify the organization and equipment of special gangs for renewing ties. In these cases it will usually be economical to give the track a light lift, using the spot board, and slide the old ties out and the new ones in during the raise. In this way a finished job can be done, leaving all of the ties, new and old, with a uniform bearing. It is quite important that the new ties be tamped solidly against the rail and that the drainage from the disturbed ballast in the cribs adjacent to the new ties be taken care of properly. Otherwise, the new tie may float in mud and the adjoining ties be called on to carry a double load. I am in favor of letting the regular section forces make the renewals of all ties, even if it becomes necessary for them to follow behind a special surfacing gang to do so.

Numerous Advantages

By O. H. Carpenter
General Roadmaster, Union Pacific, Cheyenne, Wyo.

There are numerous advantages in the use of specially organized tie gangs. In the first place these gangs can be so organized that each man has a specific task in which he becomes highly proficient, compared with the average section gang in which every man must perform all of the work connected with renewing the tie. This may be of less importance where the turnover is not large and the same men are employed year after year and all of the men in the gang are able to drive spikes and tamp ties and do the other work with equal skill.

On the other hand, sections have been lengthened and the gangs are small. Many other jobs demand attention so that the work of renewing ties, when done by section gangs, is interrupted constantly. In many cases weather conditions demand cessation of the tie renewals to permit the smoothing of the track, with the result that the program falls behind schedule and must be completed late in the year when the gang should be getting ready for winter. If track machines are being used in connection with the tie renewals, greater benefits will be realized from a smaller number of machines when used by the special gangs, since they can be used continuously throughout the season, instead of being transferred from section to section.

Supervisors are able to keep closer supervision over tie removals and the manner in which the work is being done when this work is concentrated in one or two gangs, instead of being scattered over 20 or more sections. Our tie gangs do all of the work in connection with tie renewals, except

the marking of the ties that are to come out. This is done by the section foreman, because he is better acquainted with the conditions on his section, while the tie-gang foreman would need to spend too much time away from his gang if he were required to do the marking. Our gangs renew the ties, dress the track, pile the old ties and pick up all scrap, leaving the track just as it was before they worked on it.

Among the disadvantages, if they can be considered as such, it is necessary to employ extra foremen and to provide camp outfits and additional motor cars, as well as to move the camps from station to station. The cost of tools is no greater than if the work were done by section gangs.

Some section foremen have criticized the quality of the work done by the gangs, contending that they could have done better work with their own gangs. This is probably true when the gangs are being started out, for they are generally composed of men without experience in this class of work, but as soon as they can be trained it is my observation that their work compares favorably with that of the average section gang.

Where tie renewals are very light so that the special gang would be required to cover several miles to complete a day's work, there would be no advantage in employing such a gang. Where the renewals average as many as 150 ties to the mile I believe that they demonstrate sufficient economy to justify their use. Our gangs average 10 ties per man per eight-hour day.

Question One of Economy

By H. E. Herrington
Section Foreman, Minneapolis & St. Louis, Jordan, Minn.

I can see no other basis than that of relative economy for deciding between special tie gangs and the regular section forces for making tie renewals. No class of work in railway maintenance requires the use of more kinds of tools than tie renewals. In the specialized gang each man is assigned to a particular task that requires the use of a single tool which he should always have with him. In the section gang, every man must perform at some time during the day all of the operations connected with tie renewals. He is, therefore, constantly changing the tools that he uses, losing considerable time going back to pick up this or that tool he has used previously and discarded temporarily when through with it.

Aside from the fact that men become more proficient as they become trained in the performance of a specific task, elimination of the time lost in running around searching for dropped tools is a real but often-ignored advantage of the special tie gang, for the time of every man in the gang is productive. Few men, even after long training, are equally adept at all kinds of work. For this reason the special gang offers a further advantage in that the foreman is able to assign his men to the job for which they show the greatest aptitude. It is the general testimony of those who have had experience with special tie gangs that more ties are renewed per day per man and that the unit cost of renewal per tie is lower with the special gang than with the regular section forces.

Specialized gangs can be used with equal advantage whether the ties are to be spotted in or the renewals are to be made in connection with general surfacing. They cannot be justified, however, where the renewals average less than, say, 100 to the mile, for too much time will be lost in moving forward, making the ration of unproductive time to total time too high. In any event, the ties for insertion should be distributed in advance and in such manner that time will not be lost in carrying them to the point of use.

Removing Water from Scale Pits

What is the best method of removing water from scale or other pits where the cost of a drainage line is prohibitive?

Small Bilge Pump Best

By J. P. Hanley
Water Service Inspector, Illinois Central, Chicago

A small bilge pump, usually driven by a ¼ or ⅓ hp. motor is preferred for this service. The current for its operation can usually be taken from the electric-lighting system. Where current is not available, a hand pump similar to those used on kitchen sinks does fairly well, provided an employee is available to operate it occasionally. The use of cellar drains operated on the principle of the water ram can be used. They are not recommended, however, owing to the probability of water waste.

In constructing pits where natural drainage is not practicable, care should be exercised to secure waterproof concrete walls, and the deck should be designed to prevent surface water from entering, so far as this is practical. A floor sump of more than the usual capacity should be included in the design of the scale pit to prevent the necessity for too frequent pumping.

Water-column pits provide a somewhat similar problem where natural drainage is not available. In this case it may be possible to provide partial drainage, that is, for the top part of the pit, and pump drainage for the lower part. This scheme provides an outlet for the column drainage but requires the pumping of the remainder of the water when making repairs. Coaling-station pits are usually drained by bilge pumps operated from the station power supply. A few cases are recalled, however, where hand pumps have been used satisfactorily for this purpose.

Several Methods Available

By G. A. Rodman
General Supervisor Bridges and Buildings, New York, New Haven & Hartford, New Haven, Conn.

Assuming that the scale pit has been designed properly and that the floor is pitched toward a central sump, it becomes a comparatively simple matter to install some form of automatic pumping device at reasonable expense, depending on the form of power available. Where electric current is available an automatic pump with float is satisfactory. Several so-called cellar drainers are on the market, that can be operated by water under pressure, so that if there is a water line close at hand one of these devices can be installed with either manual or automatic control.

If either steam or air under sufficient pressure is available, it can be utilized to operate a manually controlled ejector or jet pump. These pumps are made in capacities sufficient to meet any local requirements.

Where no source of power is convenient and the amount of water is more than can be handled economically with a hand pump, a gasoline-operated centrifugal pump can be installed as a permanent fixture or the portable type may be used only at times of high water. Pumps of this type will deliver 8,000 gal. per hour. Where the amount of water is small and needs to be handled only at infre-

quent intervals, some type of manually-operated lift pump may answer all purposes.

Keep Water Out

By Supervisor of Bridges and Buildings

Prevention is always better than cure, for which reason scale pits should be constructed of dense concrete and waterproofed. The deck should be of such design as to exclude water that falls in the form of rain or that originates from melting snow. A scale pit should never be located where it is likely to be submerged by flood waters. The importance of keeping scale pits dry is often overlooked. If natural drainage is impracticable, a water-tight sump should be provided and some device should be installed to insure that if water does get in, it can be pumped out before it gets high enough to reach the scale parts. Steam or air ejectors, small electrically-operated centrifugal pumps, water motors and hand pumps are all suitable for this service.

Another feature of scale maintenance is often overlooked, this being condensation on the scale parts during humid weather. To avoid this, some means should be provided for circulating air and drying the pit.

Ballast at Railway Crossings

What practical means can be employed to clean stone ballast at railway crossings subject to heavy traffic? To keep it clean?

Each Problem Individual

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

Every railway crossing subject to heavy traffic presents a problem peculiarly its own. If it is in open country and does not involve too many tracks, the simplest, the best and the most economical way to keep the ballast next to the crossing timbers or supports free for drainage is to give the crossing a slight but uniform raise and then fill in with fresh ballast.

A primary objection to this practice is that the track may get high for the interlocking appliances, if the crossing is interlocked. If it is not interlocked a slight raise does the job. If it is interlocked it may be expedient and economical to adjust the interlocking appliances to a higher elevation. This can be done when they are being given a general overhauling.

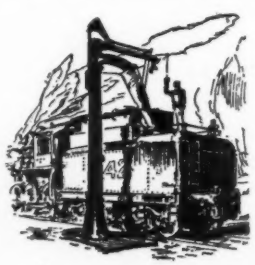
Where the conditions surrounding the crossing prevent any raise, drainage becomes the first consideration. Drainage must be provided; otherwise the cleaning of the ballast produces little lasting benefit. There is little point to spending the time and effort necessary to clean or replace the ballast at a crossing and then allow mud to squirt into it from the roadbed. In some cases, sub-ballast slabs or other special support on the subgrade, are economical. This will depend on the character of the soil, its bearing capacity and the adequacy of the drainage that can be provided economically.

Stone ballast that is drained adequately and supported properly does not need to be cleaned often. When this does become necessary, the best and cheapest method is to dig out the dirty ballast, and then fill in with clean ballast. To prevent recurrence of the trouble, the drainage should be put in the best possible condition. The problem then resolves itself into keeping the drainage through the ballast open so that water will be free to flow through it; and preventing dirt from the bottom from working into the ballast. This can only be done by adequate drainage which, if provided, will keep the ballast clean.

Drainage Essential

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Even with the best of care ballast in railway crossings will eventually become foul, but the rate at which the fouling occurs will depend rather definitely on the conditions surrounding the installation. If drainage is inadequate or non-existent, no amount of effort will keep the ballast clean. Fouling may occur from either the top or the bottom, or both. If the drainage is adequate, fouling from the bottom will not occur or it will be retarded considerably. If fouling from the top is allowed to progress without attention, drainage will become blocked and both sources will become operative.



A large percentage of the railway crossings of the country are in terminals, where drainage is difficult or impracticable. Not a few of these crossings have the further disadvantage of serving multiple track on both lines, so that there are many crossing units and a considerable area involved in the installation. In these cases the difficulties of providing drainage and of keeping the ballast clean are increased materially.

On roads that handle coal and ore, dust sifts from the cars as they are jarred in passing over the crossings, forming a difficult situation to cope with. In a relatively short time the ballast becomes filled and when it rains the crossings churn and a sludge forms. At this stage the ballast needs cleaning, for if the sludge gets into the drains it will block them. Simply tamping the ties to tighten them will be of little benefit, for these conditions can be improved only by cleaning the ballast and then keeping it dry. The ties should be tamped to a solid bearing, however, for from the minute they begin to work loose a whole train of undesirable consequences follow.

Roadbed or sub-ballast slabs are helpful in improving conditions at crossings. They do not cure all of the troubles, however, especially where dirt sifts from cars, and it becomes necessary to clean or replace the ballast from time to time, the intervals depending on the adequacy of the drainage and the amount of dirt reaching the ballast.

Must Dig It Out

By J. B. Martin
General Inspector of Track, New York Central, Cleveland, Ohio

We have never discovered any practical way of cleaning ballast at railway crossings except to dig it out and replace it with new ballast. In many cases the ballast is fouled from the subgrade and this makes it essential that good drainage be installed. In this respect, every crossing presents an individual problem that must be solved in the light of local conditions. After drainage has been established, particular attention should be directed toward keeping the drainage channels open. Concrete slabs under crossings

have been of decided help in some instances.

Where dirt gets in the ballast from the top, that is, from cars, it is sometimes helpful to use fine ballast as a top dressing to trap the dirt, thus preventing it from reaching the ballast below the ties. This course of fine ballast can be removed readily and cleaned or replaced as required.

Picking up Track Too Early

Can one start too early in the spring to pick up track? Why? If so, what are the effects? Does the kind of ballast make any difference?

It Is Possible

By C. S. Robinson
Assistant Chief Engineer, Boston & Maine, Boston, Mass.

It is possible to start the picking up of track too early in the spring, particularly where the track is subject to frost action. The maintenance forces should not be allowed to pick up track or do spot surfacing until the frost is out of the ground and the high spots caused by heaving have returned to their normal elevation, so far as they will return. Attempts to surface too early where heaving has occurred will result in rough and uneven track that can be corrected only by a general surfacing lift.

This is true with any kind of ballast, but it should be borne in mind that the better the ballast and drainage the less the track will be subjected to distortion from frost. The poorer types of ballast, which retain water or moisture to a greater extent, retard the date on which surfacing may be commenced. Surfacing should not be permitted until the ballast has dried out sufficiently to be worked without any tendency toward puddling.

Wait Till Frost Is Out

By E. D. Bentz
Roadmaster, Chicago & North Western, Fremont, Neb.

If one attempts to pick up track before the frost is out and the ground has settled he may do considerable damage to the rail and to the track as a whole. Obviously, as winter ends, every one responsible for the condition of the track is eager to get it in the best possible shape as soon as weather conditions permit, but in this section of the country considerable heaving occurs during the winter, and in some cases it is dangerous, as well as undesirable for other reasons, to disturb the track where it has heaved while the frost is leaving.

While the frost leaves the ground quickly after it starts to do so, in most cases it leaves unevenly, that is, there will be intervals of 20 to 30 ft. where the frost seems to have disappeared, while other stretches will be frozen solidly. This creates rough track, but if the thawed spots are picked up at this time, the track will be in still worse shape when the frozen spots thaw.

There are times when portions of the track become too rough for full speed while the frost is going out. Where this occurs there is nothing to do but put a slow order on it. While slow orders are undesirable, every maintenance officer who has had experience with severe heaving, knows that there may be times while frost is leaving the ground that the track cannot be kept safe for high speed. After the frost is out, however, there is no reason why all rough spots and low places should not be surfaced or picked up as rapidly as the forces available will permit.

Preparing for Spring Floods

What preparation should be made during the late winter and early spring to prevent damage to bridges and culverts by spring floods?

Keep Channels Clean

By John L. Vogel
Bridge Engineer, Delaware, Lackawanna & Western, Hoboken, N.J.

While many details are involved in the preparations that are necessary to pass flood waters through drainage openings, the whole matter can be simmered down to a single statement, namely, keep the channels clear. Careful inspection should be made to ascertain whether debris has collected in the vicinity of the structures; whether further erosion has taken place since the last inspection as a result of ice or heavy rains; and whether any noticeable change has been made in the bed of the stream. The stream should be examined for some distance both above and below the bridge for ice jams or other obstructions that may impede the flow of water or deflect the current.

If debris has collected it should be destroyed, moved to the downstream side of the bridge or otherwise disposed of at once. If further erosion has occurred immediate steps should be taken to protect the structure and the adjacent embankment. If the stream bed has changed, the necessary precautions should be taken to prevent further change or ill results from the present conditions. Ice jams should be broken up so that water will not be impounded behind them and come down in great volume when the jam finally gives way.

While the foregoing precautions should be taken prior to the approach of spring and the breaking up of ice-bound streams, I consider it essential that all structures and drainage channels be inspected carefully in the fall and that all undesirable conditions be corrected at that time. If this is done, the late winter inspection will be more in the nature of a drive to bring previous information up to date and provide an opportunity to correct unsatisfactory conditions that have developed since the autumn inspection.

Begin in Fall

By Division Engineer

Preparation to combat damage from spring floods should not be delayed until winter or spring but should begin in the fall. While no one can foretell with certainty either the magnitude or the effect of spring floods, experience has taught that certain preparations are essential if damage is to be prevented or minimized. Probably the most important item is to know that channels are clear and will not impede the flow or bring down debris to lodge against piers, spans or culvert openings, and that no conditions exist downstream to block the water after it has passed the opening. Any work necessary to assure free passage of the water can be done better during the fall than after the ground and stream are frozen.

On the other hand, channels are often blocked by heavy accumulations of ice and deep, well-packed snow. In this case, it is obviously the work of late winter or early spring to clear the channels of such accumulations to insure the passage of the water when thawing begins. The importance of having channels clear in these circumstances is greatly increased if the warm spell is accompanied by rain.

A late winter inspection is desirable to determine whether any channel changes have taken place, whether scour has occurred or whether any other conditions have been created at points that might endanger any of the structures. If any of these are found, measures should be taken as needed to overcome the potential danger.

Division officers know from experience where the most probable danger points are. They should have a complete inventory of the material and equipment available and should make arrangements that will insure that these materials and equipment and the needed forces can be moved to any danger point in minimum time when needed. All structures at which there is any prospect of danger should be patrolled during the emergency.

Short Lengths of Lumber

When preparing bills of material for new buildings or for the repair of existing structures, to what extent is it practicable to specify short lengths of lumber? What are the advantages? The disadvantages?

Entirely Practicable

By General Inspector of Buildings

Some roads buy and stock certain staple sizes of building lumber much as they do ties and some dimensions of bridge material. There is a distinct advantage in this practice because the lumber is given an opportunity to season before use. I prefer air-seasoned lumber to that that has been kiln dried. Where this practice is followel there is a tendency to purchase the common grades in 16-ft. lengths with the view of decreasing the amount of stock to be carried.

On the other hand, it is the custom to purchase finishing lumber in random lengths from 10 to 20 ft. Ordinarily a better price can be obtained when random lengths are permitted than is possible where selected lengths are specified. Short lengths are fully as usable in the ordinary railway building, for any carpenter knows that in the average frame building at least one-fourth of the material in the finished structure is eight feet or less as it is applied, so that the use of short-length lumber often prevents waste during construction while it does not affect either the appearance or the strength of the structure.

I see no reason for paying the higher price for the common lumber, especially where considerable building construction and maintenance are going on, for the foregoing statement is just as true for the common grades as for the finishing grades. Some building officers take the position that it is not safe to permit random lengths, except perhaps to a limited extent, in the common grades on the ground that it is not feasible to forecast with any degree of accuracy the requirements for the year. This does not sound convincing, for in the same breath they assume that they can forecast the total requirements.

I consider it entirely feasible to permit the inclusion of random lengths, but would recommend that the amount 8 ft. and under be limited to about 25 per cent of the total purchase and that no lengths less than 5 ft. be accepted. Obviously, this refers to the run of stock for general construction and maintenance purposes. If buildings of special design are to be erected, the bill of material can be specified with no variations allowed. Even in such structures some short lengths are usually permissible.

Short Lengths Reduce Cost

By Supervisor of Bridges and Buildings

Every saw mill produces some short lumber and must dispose of it or class it as a total loss. If it becomes a drug on the market a higher price must be asked for the longer material to cover the loss on the unsalable product, for few mills are equipped to store slow moving lumber against the time when it can be sold. While the amount varies, depending on the species of wood and the mill practice, on the average from 5 to 10 per cent of the building sizes of lumber produced is 8 ft. or shorter.

Prices also vary with the locality, with the demand and with the grade, but as a general statement random short lengths of selected grades can be purchased at a lower price than long lengths of the common grades. In fact, this difference has amounted to as much as $12 to $20 a thousand. Similarly, there have been times when short lengths in the common grades could be purchased for as much as $12 less per thousand than random lengths from 10 to 20 ft. in the same grades, and up to $25 less than long lengths of these grades.

It is evident, therefore, that attractive savings are possible through the use of short-length lumber, provided it is adapted for the use in hand. A feature not to be overlooked in this connection is that short-length lumber is generally of better quality than the longer lengths in the same grade, since they are often entirely free from defects. The only question then to be considered is whether the short lengths can be used to advantage.

Several years ago a committee from one of the lumber associations made a detailed study of a number of frame buildings of various designs. It found that approximately 33 per cent of the lumber, as applied, was less than 8 ft. long, about 11 per cent ranged from 8 to 9 ft., and the remainder was more than 9 ft. in length. The result of this investigation indicates quite clearly that the use of short lengths of building lumber is entirely feasible and that savings up to 10 or 15 per cent are possible on from 30 to 40 per cent of the lumber entering the structure by specifying short lengths, depending, of course, upon market conditions. In some market situations the savings may be more.

Where a road carries a stock of building lumber for current use, it should be safe to allow, say, 25 per cent of the order to run at random from 5 to 8 ft. and 15 per cent to range from 8 to 10 ft., purchasing the remainder in random lengths from 10 to 16 ft. This will enable the purchasing department to obtain much more favorable prices, it will benefit the mills and it will not hamper the operation of the building forces. If at any time the stock of some of the longer lengths runs low, these lengths can be purchased at no greater disadvantage than if they had been specified originally.

To make this plan a success, however, the local building forces must be educated to use the short lumber. For some reason, building gangs prefer to use the longer lengths, possibly on the theory that the short pieces are scrap. This point of view is probably inherited from the days when lumber was plentiful and cheap. Most foremen and their men are willing to go along with the plan, once it is explained to them.

NEWS of the Month

Air Conditioned Cars

The Class I railways and the Pullman Company had 10,977 air conditioned passenger cars in operation on January 1. This was an increase of 652, compared with the number of air conditioned passenger cars in January 1, 1938. Of these cars, 6,022 were of railway ownership and 4,955 of Pullman ownership.

Bill for Reflectors on Railroad Cars

A bill has been introduced into the New York State Assembly, which would require the attachment of adequate reflectors to each side of freight cars and unlighted passenger cars on steam railroads, which would be visible for 200 ft. to motorists approaching railroad crossings on unlighted highways.

Railroads Set New Fuel Efficiency Record

The best average ever attained in fuel efficiency in freight service was established by the railroads of the United States in 1938, according to J. J. Pelley, president of the Association of American Railroads. In that year an average of 115 lb. of fuel was required to haul 1,000 tons of freight and equipment a distance of one mile. This was a reduction of 2 lb. compared with 1937, a reduction of 4 lb. compared with 1936, and a reduction of 33 per cent compared with 1920, in which year the average was 172 lb.

New R.F.C. Plan for M. & St. L. Reorganization

Chairman Jesse Jones of the Reconstruction Finance Corporation has disclosed that his corporation and interests represented by W. W. Colpitts of the firm of Coverdale & Colpitts, New York, have had under discussion a proposal for the reorganization of the Minneapolis & St. Louis by dividing it into two companies, one company to own and operate the line between Minneapolis, Minn., and Peoria, Ill., and appurtanent branches, comprising 904 miles and the other company to own and operate the remaining 519 miles. Mr. Jones indicated that if such a plan were approved by the court having jurisdiction and by the Interstate Commerce Commisison, the R.F.C. would give favorable consideration to lending up to $5,000,000 to be secured by a first mortgage not exceeding $7,500,000.

Low Circle Fares to 1939 Fairs

New sensationally low grand-circle fares, the first of their kind in the history of American railroads, will be inaugurated on April 28, affording an opportunity to see both the New York and the San Francisco world's fairs, as well as to visit many points of scenic interest throughout the country. The fares apply from all cities and towns in the United States and allow the purchaser to make the grand-circle trip to both fairs in the order desired and return without retracing routes. Under the plan an individual can purchase a grand-circle coach ticket for $90 or a first-class ticket for $135, plus the regular sleeping or parlor car charges for space occupied.

Roosevelt Appoints Alldredge on I.C.C.

President Roosevelt has appointed J. Haden Alldredge to replace Frank McManamy as a commissioner on the Interstate Commerce Commission. Mr. McManamy had been in the service of the I.C.C. for more than 30 years, with the exception of a period during the World War when he was assigned to the United States Railroad Commission, and had continued to serve, although his latest term expired on December 31, 1937, under a provision of the Interstate Commerce Commission Act which leaves an incumbent in office until his successor qualifies. Mr. Alldredge was a director of the Tennessee Valley Authority's Commerce Department and is an advocate of interterritorial freight rate readjustments.

New Chicago-San Francisco Train

The Exposition Flyer, a new air-conditioned train will be placed in service between Chicago and San Francisco, Cal., on June 10 by the Chicago, Burlington & Quincy, the Denver & Rio Grande Western and the Western Pacific. The train will operate on a 57 hr. schedule westbound and a 60 hr. schedule eastbound for the 2,532 miles. With this schedule, the train will traverse a highly scenic route during daylight hours, passing through the Colorado Rockies by way of the Moffat tunnel, the Gore Canyon of the upper Colorado river and the Feather River Canyon of the Sierra Nevada mountains. Connecting service and through cars will also be available by way of the Royal Gorge route.

Highway Subsidy Ten Billion Dollars

According to a study made by Professor C. B. Breed of the Massachusetts Institute of Technology, Professor W. S. Downs of West Virginia University, and Clifford Older, former state highway engineer of Illinois, almost $21,000,000,000 were spent upon the highways of this country in the years 1921-1932 (the latest years for which full data are available). Of this amount, they estimate that about 75 per cent, or almost $16,000,000,000, should have been paid by the users of the highways, whereas they actually paid in license fees and gasoline taxes only $6,000,000,000, leaving the remaining $10,000,000,000 to be paid by the public as a subsidy.

Hearing on Lea Transport Bill

Recommendations that the Interstate Commerce Act be completely rewritten, and a plan for reducing railroad funded debt and fixed charges, were presented at the February 3 hearing before the House of Representatives interstate and foreign commerce committee. Judge R. V. Fletcher, who has been acting as counsel for the president's committee-of-six, stated that this body believed the proper approach to new transportation legislation at this time was the complete rewritting of the Interstate Commerce Act. The debt reducing plan suggested involved the creation of a Railroad Reconstruction Finance Corporation to be controlled by the R.F.C., which would raise funds through the sale of stock or any other manner decided upon and which would buy rail bonds in the open market at below par prices agreed upon by the railroad and the R.F.C. The bonds would be redeemed and retired over a period of 10 years by the railroads at cost plus six per cent for interest on the bonds and governmental carrying charges, thereby reducing the funded debt by taking advantage of low market prices.

Personal Mention

General

I. D. Holmes, supervisor of trains and track of the Evansville district of the Illinois Central, with headquarters at Princeton, Ky., has been appointed acting trainmaster, with headquarters at Fulton, Ky.

Engineering

M. Ellwood Cridlin, secretary to the engineer maintenance of way of the Chesapeake & Ohio at Richmond, Va., has been appointed assistant to the engineer maintenance of way.

D. L. Rodgers, assistant engineer of the Cambria & Indiana, has been appointed to the newly-created position of engineer maintenance of way, with headquarters at Colver, Pa.

J. J. Desmond, division engineer of the Illinois Central with headquarters at Chicago, has been granted a leave of absence and **R. H. Carter,** assistant general yard master at Chicago, has been appointed acting division engineer.

O. M. Barlow, roadmaster on the Southern Pacific, with headquarters at Oakland Pier, Cal., has been promoted to acting assistant division engineer, with the same headquarters, replacing **Francis M. Siefer,** who has retired.

H. C. Hayes, assistant engineer on the Illinois division of the Illinois Central at Champaign, Ill., has been appointed acting division engineer of that division, replacing **C. J. Harrington,** who has taken a leave of absence because of illness.

T. W. Creighton, roadmaster of the Boundary subdivision of the Canadian Pacific, with headquarters at Grand Forks, B.C., has been promoted to division engineer of the Revelstoke division, with headquarters at Revelstoke, B.C., replacing **G. W. Miller,** who has been transferred to the chief engineer's office at Montreal, Que., as reported elsewhere in this issue.

Harry J. Seyton, whose promotion to assistant chief engineer, Lines West, of the Great Northern, with headquarters at Seattle, Wash., was announced in the February issue of *Railway Engineering and Maintenance* was born at Richmond, Ill., on June 25, 1882, and graduated from the University of Wisconsin in 1905. He entered the service of the Great Northern as an instrumentman in 1909, and two years later he was promoted to assistant engineer in the construction department. In 1915, he was transferred to the valuation division and the following year he returned to the construction department in the same capacity. Mr. Seyton was advanced to district engineer of the Central division, with headquarters at Great Falls, Mont., in 1917, and on March 1, 1920, he was transferred to Duluth, Minn. In 1925, his jurisdiction was extended over all lines east of Williston, N.D.

George W. Corrigan, former division engineer of the Los Angeles division of the Southern Pacific, who has been on a leave of absence for some time, retired on January 1, because of ill health. Mr. Corrigan was born at Harrisonville, Mo., in September, 1876, and graduated in civil engineering from Missouri University in 1900. He entered railway service the same year as a rodman on the Union Pacific, later becoming an instrumentman on location and construction. In January, 1901, he went with the Missouri Pacific as an assistant engineer and later was promoted to division engineer, engaged chiefly on location and construction work. In May, 1908, he went with the Southern Pacific as an assistant engineer and three years later he was appointed roadmaster. On September 15, 1916, he was promoted to division engineer of the Stockton division, with headquarters at Stockton, Cal., and was later transferred successively to the San Joaquin and the Los Angeles divisions.

Robert B. Jones, whose promotion to engineer of track on the Canadian Pacific, with headquarters at Montreal, Que., was announced in the February issue, was born on March 21, 1885, at Glasgow, Scotland, and obtained his early experience in railway engineering with a railway in England. From 1906 to 1910, he served in an engineering capacity with a private concern. At the end of this period he entered the service of the Grand Trunk Pacific (now part of the Canadian National) where he served as a draftsman, transitman and building inspector on the construction of the terminal at Fort William, Ont. While with this company he was also engaged on preliminary and location survey work in Saskatchewan. From 1913 to 1915, Mr. Jones served as a draftsman and transitman with the Canadian Pacific on yard design and on track revision surveys along the north shore of Lake Superior. During the World War, he served with the Canadian Field Artillery overseas as a gunner, sergeant and lieutenant, returning to the Canadian Pacific in 1919 as an assistant engineer in the office of the chief engineer. He was holding this position at the time of his recent appointment.

Robert B. Jones

R. Mudge, whose promotion to assistant engineer of track on the Canadian Pacific, with headquarters at Montreal, Que., was announced in the February issue, was born on May 1, 1885, at Montreal, and was educated at McGill University, graduating in engineering in 1906. On August 15, 1907, he entered the service of the Canadian Pacific, and was engaged for five years on the location and construction of new lines and on double-tracking projects. From 1912 to 1914, he served as assistant engineer at Montreal, and during the war he saw active service overseas as a railway construction engineer with the rank of captain. Following the war, Mr. Mudge returned to the Canadian Pacific as assistant engineer on railway location and construction. In 1925, he was assigned to the general office, where he was engaged on valuation work and in the design of yards and terminals. Mr. Mudge retained the title of assistant engineer until his recent appointment as assistant engineer of track.

J. B. Jones, whose promotion to division engineer of the St. Louis division of the Pennsylvania, with headquarters at Terre Haute, Ind., was announced in the February issue, was born at Danville, Ill., on March 22, 1905, and graduated in civil engineering from the University of Illinois in 1926. He entered railway service on July 1, 1926, as a rodman on the Chicago & Eastern Illinois and on April 1, 1927, he went with the Pennsylvania as an assistant on the engineering corps of the Logansport division. On July 16, 1929, he was appointed assistant supervisor of track on the Cumberland Valley division, with headquarters at Chambersburg, Pa., later serving in that capacity on the Middle division, the Baltimore division, and the Philadelphia division. Mr. Jones was promoted to track supervisor on the Baltimore division, with headquarters at Washingon, D.C., on June 1, 1934, and on January 1, 1935, he was transferred to the New York division, with headquarters at New York.

T. S. Pattison, whose promotion to division engineer on the Chesapeake & Ohio, with headquarters at Covington, Ky., was announced in the January issue, attended the College of Liberal Arts, Washington College, Chestertown, Md., and graduated in civil engineering from the Virginia Military Institute, Lexington, Va., in June, 1910. He entered railway service in September, 1910, as a rodman in the maintenance of way department of the Baltimore

T. S. Pattison

& Ohio, and in May, 1911, he was promoted to levelman on construction work. In September, 1912, he was appointed transitman in the office of the district engineer maintenance of way, Wheeling, W. Va., and four months later he went with the Tennessee Coal, Iron & Railroad Company at Birmingham, Ala., as a draftsman in the land department. In January, 1914, he went with the Southern as an inspector of buildings on the Southern district, with headquarters at Birmingham. A year later, Mr. Pattison returned to the B. & O. as an assistant supervisor of track on the Chicago division and was later promoted to supervisor of track, serving at Foxburg, Pa., and Washington, Pa., and to assistant division engineer at Pittsburgh, Pa. In May, 1917, he was called to active duty as a captain in the Engineer Section, Officers' Reserve Corps, and was assigned to the Fifth Engineers' regiment, U. S. Volunteers, later being promoted to major. At the close of the war, Mr. Pattison returned to the B. & O. as a general roadmaster, and was later promoted to division engineer, serving in that capacity at Keyser, W. Va., Gassaway and Grafton. In 1921, he became managing director of the Scioto Realty and Development Company but five years later returned to railroad service as a resident engineer on the Chesapeake & Hocking (now part of the Chesapeake & Ohio), at Chillicothe, Ohio. Mr. Pattison was promoted to assistant division engineer, with headquarters at Chillicothe, in 1927, and held that position until his recent promotion.

Samuel R. Hursh, whose promotion to engineer maintenance of way, Eastern Pennsylvania division of the Pennsylvania, with headquarters at Harrisburg, Pa., was announced in the February issue, was born in Mifflinburg, Pa., in March, 1894, and following his graduation from Pennsylvania State College in 1916 he began work for the Pennsylvania and has been continuously in its service, except for a furlough for military service during the World War. Mr. Hursh served consecutively as chairman, rodman, assistant supervisor and supervisor on several divisions in the eastern part of the System. He was appointed division engineer in the maintenance of way department in November, 1928, and thereafter served in that capacity on the Atlantic, the Philadelphia Terminal divisions and the Pittsburgh divisions. Mr. Hursh was appointed superintendent of the Wilkes-Barre division at Sunbury, Pa., in October, 1934, and on April 1, 1935, was transferred to the Maryland division at Wilmington, Del. In July, 1938, he was appointed acting engineer maintenance of way of the Eastern Pennsylvania division, with headquarters at Harrisburg, Pa., the position he held at the time of his recent promotion.

Samuel R. Hursh

William F. Cummings, acting chief engineer of the Boston & Maine, the Maine Central and Portland Terminal, with headquarters at Boston, Mass., has been promoted to chief engineer of these companies, succeeding the late **Asa H. Morrill. Chauncy S. Robinson,** assistant chief engineer of these roads at Portland, Me., has been transferred in the same capacity to Boston. **Timothy G. Sughrue,** division engineer of the Terminal division of the Boston & Maine at Boston, has been promoted to engineer of maintenance of way of the Maine Central and Portland Terminal, with headquarters at Portland, assuming duties vacated by Mr. Robinson. **Joseph A. Parant,** principal assistant engineer of the Boston & Maine, has been promoted to assistant to the chief engineer of that road, at Boston. **Stanley G. Phillips,** assistant division engineer of the Terminal division of the Boston & Maine, has been promoted to division engineer of that division, succeeding Mr. Sughrue. **Harold W. Legro,** has been promoted to assistant division engineer of the Terminal division.

William F. Cummings

Mr. Cummings entered the service of the Boston & Maine on October 22, 1906, as a chainman. He was successively promoted until April 1, 1914, when he was appointed assistant engineer in the office of the valuation engineer in connection with the federal valuation of railroads. On January 1, 1921, he was appointed valuation engineer and in January, 1926, assumed the additional duties of auditor of disbursements. On April 1, 1927, he was appointed engineer of maintenance of way; on November 1, 1928, assistant chief engineer of the B. & M., and on August 1, 1936, assistant chief engineer also of the Maine Central and the Portland Terminal. On December 19, 1938, Mr. Cummings was appointed acting chief engineer of the three companies, due to the illness of the chief engineer. He has been active in the affairs of the American Railway Engineer Association, of which he is a past director.

Mr. Robinson entered the service of the Maine Central as a rodman on July 1, 1909, and in October, 1912, he was appointed assistant engineer. In 1919 he was promoted to general supervisor maintenance of way and five years later his title was changed to engineer maintenance of way. In January, 1936, Mr. Robinson was appointed assistant engineer maintenance of way of the Maine Central and the Boston & Maine. He held the latter position until July 1, 1937, when he was promoted to assistant chief engineer of these roads, with headquarters at Portland, Me., where he remained until his recent appointment. In the capacity of assistant chief engineer at Boston, Mr. Robinson assumes new duties carrying increased authority and responsibility.

Chauncy S. Robinson

Mr. Sughrue has been connected with the Boston & Maine continuously for nearly 30 years. He was born at Nashua, N. H., on February 22, 1889, and was educated at the University of New Hampshire. During summer vacation periods while in college Mr. Sughrue served with the B. & M. as a clerk in the operating department and as a section laborer. On August 2, 1909, he entered the service of this company permanently, serving as office assistant to the chief engineer and division engineer until June, 1914, when he was advanced to assistant supervisor of bridges and buildings at Nashua. Three years later, Mr. Sughrue was promoted to supervisor of bridges and buildings, with the same headquarters, being transferred to Salem, Mass., in 1925. Two years later, he was promoted to division engineer of the Portland division, with headquarters at Salem, being transferred to the Terminal division at Boston in 1929. He remained at Boston until his recent appointment as engineer maintenance of way of the Maine Central and the Portland Terminal, with headquarters at Portland.

Percy O. Ferris, whose promotion to engineer maintenance of way of the Delaware & Hudson, with headquarters at Albany, N. Y., was announced in the February issue, was born on May 29, 1892, at Peekskill, N. Y., and attended Matteawan High

School and Rensselaer Polytechnic Institute (1912-1916. He entered railroad service on July 19, 1917, as a rodman with the Delaware & Hudson, and became senior transitman in August, 1917; assistant roadmaster in November, 1920; track supervisor in November, 1921; and roadmaster in September, 1924. From May, 1925 to April, 1938, Mr. Ferris served as assistant engineer of maintenance of way and on the latter date became division engineer. He held the latter position until July, 1938, when he was

Percy O. Ferris

apointed acting engineer maintenance of way, the position he held until February 1, when he was appointed engineer maintenance of way.

Track

Samuel Carlson, supervisor of track of the Cambria & Indiana, with headquarters at Colver, Pa., has retired after 26 years service with this company. This position has now been abolished.

A. C. Palmer, supervisor on the Reading at Tamaqua, Pa., has been transferred to Landsdale, Pa., succeeding **F. K. Keens,** transferred. **J. E. Reese** has been appointed assistant supervisor at Philadelphia, Pa., succeeding **P. W. Early,** transferred.

W. T. Wilding, section foreman on the Canadian Pacific at Binscarth, Man., has been promoted to roadmaster on the Portage division, Manitoba district, with headquarters at Winnipeg, Man., succeeding **C. K. Holden,** whose transfer to the Kenora division was announced in the February issue.

Leo E. Donovan, section foreman on the Illinois division of the Illinois Central, has been promoted to track supervisor of the South Amboy, North Clinton and East Havana districts of the Springfield division, with headquarters at Clinton, Ill., succeeding **C. S. Collier,** who has been promoted to acting supervisor of trains and track of the Evansville district, with headquarters at Princeton, Ky., replacing **I. D. Holmes,** whose promotion to acting trainmaster is reported elsewhere in this issue.

H. C. Arnold, track supervisor on the Alliance Division of the Chicago, Burlington & Quincy, with headquarters at Ravenna, Neb., has been promoted to roadmaster on the Sterling division, with headquarters at Curtis, Neb., succeeding **L. W. Jones,** who has been transferred to the Sheridan division, with headquarters at Gillette, Wyo., and with jurisdiction between Edgemont, S.D., and Clearmont, Wyo. **Leslie Cross,** roadmaster with headquarters at Sheridan, Wyo., will continue, with jurisdiction over the remainder of the Sheridan division.

C. K. Holden, whose transfer as roadmaster on the Portage division of the Canadian Pacific, to the Kenora division, with headquarters as before at Winnipeg, Man., was announced in the February issue, has been transferred again to the Boundary subdivision, with headquarters at Grand Forks, B.C., replacing **T. W. Creighton,** whose promotion to division engineer, with headquarters at Revelstoke, B.C., is announced elsewhere in these columns. **J. A. MacDonald,** roadmaster on the Portage division, with headquarters at Deloraine, Man., has been transferred to Winnipeg, relieving Mr. Holden and **Robert A. Emerson,** transitman on the Regina division, has been promoted to roadmaster, with headquarters at Deloraine, succeeding Mr. MacDonald.

Lloyd P. Larkey, whose promotion to track supervisor on the Louisville & Nashville, with headquarters at Hazard, Ky., was announced in the February issue of *Railway Engineering and Maintenance* first entered the service of the L. & N. on July 4, 1911, at Baxter, Ky., in the construction department. On December 19, 1911, he was appointed a timekeeper at Jackson, Ky. On November 1, 1912, he was promoted to assistant foreman and on June 1, 1913, he was promoted to extra gang foreman on the Eastern Kentucky division. He served as an extra gang foreman and section foreman on the Eastern Kentucky and Kentucky divisions until April 1, 1919, when he was appointed section foreman at Hazard, Ky., the position he held at the time of his promotion to track supervisor.

Harry F. Elliott, whose promotion to roadmaster on the Salt Lake division of the Southern Pacific, with headquarters at Ogden, Utah, was announced in the February issue of *Railway Engineering and Maintenance* was born at Corinne, Utah, on July 24, 1898, and entered railway service on May 15, 1922, as a rodman in the engineering department of the Salt Lake division. In March, 1923, he was promoted to junior instrumentman and in June, 1925, he was advanced to senior instrumentman. In April, 1929, he was appointed assistant engineer on double track construction at Lovelock, Nev., and in January, 1930, he was appointed instrumentman. In April, 1935 he was promoted to assistant engineer and general foreman in charge of rail relay and ballast work, also serving as a relief roadmaster. His promotion to roadmaster was effective on January 1.

Francis W. Scott, whose retirement as roadmaster on the Canadian National, with headquarters at Brandon, Man., was reported in the February issue, was born at Kendal, England, on December 5, 1873, and attended Cowards Commercial School. He entered railway service in April, 1891, as a sectionman on the Canadian Pacific at Langovin, Alta. In August, 1892, he was promoted to foreman at Kininvie, Alta., and for the following eight years served as a foreman and extra gang foreman on the Kenora subdivision. In 1901 and 1902, he served as extra gang foreman at Calgary, Alta., and Medicine Hat and in the latter year he was advanced to roadmaster, with headquarters at Moose Jaw, Sask., later being transferred to Calgary and Medicine Hat. In July, 1908, he went with the Canadian National as a foreman and extra gang foreman on the Emerson subdivision, and in 1920, he was promoted to assistant roadmaster at Fort Rouge, Man. Mr. Scott was advanced to roadmaster with headquarters at Brandon on May 15, 1923, and continued in that position until his retirement on December 5, 1938.

Bridge and Building

James Lundie, a transitman on the Canadian Pacific at Moose Jaw, Sask., has been promoted to bridge and building master, with headquarters at Regina, Sask., succeeding **L. Kinshella,** who has retired on pension. Mr. Lundie was born at St. Thomas, Ont., on April 10, 1907, and graduated in civil engineering from the University of Saskatchewan in 1930. He entered railway service on May 23, 1928, as transitman on the Canadian Pacific at Moose Jaw, Sask., which position he held at the time of his recent appointment. His appointment as bridge and building master was effective January 1.

Thomas E. Jackson, whose promotion to supervisor of bridges and buildings of the Tuscon division of the Southern Pacific, with headquarters at Tucson, Ariz., was announced in the February issue of *Railway Engineering and Maintenance* was born at Sterling City, Tex., on April 27, 1897, and entered railway service on October 1, 1918, as a bridge and building helper on the Atchison, Topeka & Santa Fe at Prescott, Ariz. In October, 1920, he was promoted to bridge and building carpenter and on May 1, 1921, he was advanced to bridge inspector. On January 1, 1922, he was appointed bridge and building foreman, and on November 10, 1925, he went with the Southern Pacific at Tucson in the same capacity. Mr. Jackson was appointed bridge inspector on the Tucson division on January 15, 1932, and on January 1, 1936, he was promoted to general foreman. On February 6, 1937, he was appointed acting bridge and building supervisor at Tucson, returning to his former position in November, 1937. His promotion to bridge and building supervisor was effective December 16, 1938.

Obituary

George Lewis, former general manager and chief engineer of the Moffat Tunnel Commission of Colorado, died at Denver, Colo., on February 5.

Charles W. McCandless, who retired in 1937 as bridge and building supervisor on the Los Angeles division of the Southern Pacific, with headquarters at Los An-

geles, Cal., died on December 15.

Daniel C. Rounseville, for 48 years in the engineering department of the Chicago & North Western, and assistant chief engineer of that road at the time of his retirement in November, 1926, died at his home in Oak Park, Ill., on February 28.

J. Burleigh White, who retired October 1, 1925, as general water supply supervisor of the Iowa division of the Chicago & North Western, with headquarters at Boone, Iowa, died at San Pedro, Cal., on January 19, at the age of 83. Mr. White was born in England and came to this country at the age of 17. He served in the water service department of the Burlington, Cedar Rapids & Northern (now a part of the Chicago, Rock Island & Pacific) at Cedar Rapids, Iowa, for approximately 30 years before entering the service of the North Western on September 11, 1904.

Colonel Charles L. Whiting, superintendent of the Chicago Terminal division of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, and an engineer by training and experience, died following a lingering illness on February 13, in Hot Springs, Ark. Colonel Whiting was born in Danvers, Mass., on January 31, 1874, and entered railway service on the Boston & Maine in 1890. In 1897, he went with the New York Central & Hudson River (now part of the New York Central system), serving in the engineering department, and in 1902, he went with the Northern Pacific in the engineering department. In 1907, he entered the service of the Milwaukee as a roadmaster on western construction work, and in 1912, he was promoted to superintendent of construction. He was appointed division superintendent in 1914, and was located at Lewistown, Mont., at the time he left to serve overseas with the 13th Engineers of the U. S. Army. Colonel Whiting returned in July, 1919, and was reappointed superintendent of the Northern Montana division, with headquarters at Lewistown. After serving on several other divisions, Colonel Whiting was transferred to the Chicago Terminal division in May, 1923.

Colonel Jenks Buffum Jenkins, valuation engineer of the Baltimore & Ohio, with headquarters at Baltimore, Md., died on February 1 at his home in that city. Colonel Jenkins was born at Allegheny City, Pa., on January 28, 1869. He was graduated from the University of Pittsburgh as a civil engineer in 1888 and entered railroad service the following year as a levelman on the engineering corps of the Maryland Central (now Maryland & Pennsylvania), subsequently serving as assistant resident engineer, transitman and chief of party. Colonel Jenkins went with the Baltimore & Ohio as an assistant engineer on November 18, 1889, serving in the maintenance of way department and subsequently in the real estate department and later became a transitman on construction. Leaving the service of the Baltimore & Ohio in April, 1893, he was engaged in private practice as a civil engineer and, following service with the City of New York, he returned to the Baltimore & Ohio on May 1, 1900, as assistant engineer. On November 1, 1910, his jurisdiction was extended over the entire system and on March 1, 1914, he was promoted to valuation engineer. After service in the World War, Colonel Jenkins returned to the B. & O. as valuation engineer on August 18, 1919, the position he held until his death.

Milo M. Backus, assistant engineer of maintenance of way of the Illinois Central, with headquarters at Chicago, died of pneumonia on February 26 at the Roseland Community Hospital in that city. Mr. Backus was born at Clinton, Iowa,

Milo M. Backus

on April 3, 1880, and attended Cornell College, Mt. Vernon, Iowa. He entered railway service on April 20, 1902, as a chainman in the engineering department of the Illinois Central, and until August, 1906, served successively as chainman, rodman and instrumentman on construction work. Upon the latter date he was promoted to assistant engineer on the Kentucky division. In December, 1912, he was appointed supervisor of track on the Carbondale district of the St. Louis division, later being transferred to the Paducah district of the Kentucky division. In November, 1914, he was advanced to roadmaster of the Springfield division and in June, 1917, he was transferred to the St. Louis division. Mr. Backus was promoted to district engineer of the Western Lines, with headquarters at Waterloo, Iowa, in July, 1920, and in January, 1925, he was further advanced to assistant engineer of maintenance of way, with headquarters at Chicago. He was promoted to assistant chief engineer maintenance of way in August, 1938.

William H. Sellew, former principal assistant engineer and later assistant valuation engineer of the Michigan Central, who retired from the latter position on August 31, 1927, died on January 29, at Ann Arbor, Mich. Mr. Sellew was born at Cincinnati, Ohio, on November 30, 1875, and graduated from Massachusetts Institute of Technology in 1897. He entered railway service in July of that year with the Cincinnati, Hamilton & Dayton (now part of the Baltimore & Ohio), and in 1899, he went with the Cleveland, Cincinnati, Chicago & St. Louis (Big Four), as an assistant engineer. In 1901, he became a resident engineer on the construction of an extension of the Indiana, Decatur & Western (now part of the B. & O.) and later that year went with the Pennsylvania on location surveys and construction work. In 1905, he went with the Michigan Central and on January 1, 1906, he was promoted to division engineer, with headquarters at Detroit, Mich. On June 1, 1907, he was advanced to principal assistant engineer with the same headquarters, and on December 1, 1913, he was appointed assistant engineer in the valuation department. He was promoted to assistant valuation engineer on November 1, 1917, and held that position until he left the service of the Michigan Central on August 31, 1927. Mr. Sellew was a non-resident lecturer on railway engineering at the University of Michigan for a number of years, and was the author of several books on railroad subjects.

Thomas Benton Hamilton, an engineer by training and experience, who retired as vice-president on the Pennsylvania, with headquarters at Chicago, on May 1, 1932, died at Culver, Ind., on February 18, as the result of a cerebral hemorrhage. Mr. Hamilton was born in Columbus, Ohio, on August 7, 1865, and graduated from Princeton University in 1888. He entered railway service with the Pennsylvania in November, 1888, as a rodman on the Louisville division. In 1890, he was transferred to the Pittsburgh division as assistant on the engineering corps and on January 1, 1896, he was promoted to assistant engineer. In May, 1897, he was advanced to engineer of maintenance of way of the Toledo division, later being transferred to the Cincinnati and to the Cleveland and Pittsburgh divisions. On

Thomas Benton Hamilton

June 1, 1901, he was promoted to superintendent of the Erie and Ashtabula division and on December 21, 1903, he was transferred to the Cleveland and Pittsburgh division. Mr. Hamilton was advanced to general superintendent of the Central system in 1912, and was then advanced through various operating and executive positions until 1926, when he was elected vice-president of the Western region in charge of all departments. In 1929, Mr. Hamilton was assigned to the direction of matters of general interest and policy, retaining the title of vice-president until his retirement

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Association News

Railway Tie Association

The Railway Tie Association will hold a convention at the Hotel Netherland Plaza, Cincinnati, Ohio, on May 23-24. This will be the first convention that this organization has held since 1936.

Metropolitan Track Supervisors Club

Seventy-four members and guests were in attendance at the meeting of the club at the Hotel McAlpin, New York City, on February 9. The meeting was addressed by four speakers, each of whom considered a different phase of special trackwork. They included A. F. Huber, chief engineer, Ramapo Ajax Corporation, who spoke on design; H. S. Heyl, superintendent, Taylor-Wharton Iron & Steel Company, on manufacturing methods; B. Blowers, division engineer, Erie, on installation; and J. M. Fox, division engineer, Pennsylvania, on maintenance.

Maintenance of Way Club of Chicago

Weed Control and Eradication was the subject at the meeting of the club on February 27, when 130 members and guests were in attendance. W. H. Hillis, engineer maintenance of way of the Chicago, Rock Island & Pacific, was the speaker.

On March 15, the club will meet jointly with the Western Railway Club and the American Railway Engineering Association at the Hotel Sherman, at 6:00 p.m., to hear H. R. Clarke, engineer maintenance of way of the Chicago, Burlington & Quincy, and Kenneth Cartwright, mechanical engineer, New York, New Haven & Hartford, discuss The Relation of Locomotive Design to Rail Maintenance.

The next regular meeting will be held at the Auditorium Hotel on March 27, when The Place of Young Men in the Railway Field will be discussed by C. E. Morgan, superintendent of work equipment and track welding, Chicago, Milwaukee, St. Paul & Pacific; E. L. Potarf, district engineer maintenance of way, Chicago, Burlington & Quincy; and V. G. Walling, division superintendent, track and roadway department, Chicago Surface Lines.

Bridge and Building Association

The officers and members of the Executive Committee have completed the selection of the personnel of committees to study and report at the next convention in October, and all committee members have been notified. As announced by President Armstrong Chinn (Alton), the committees are as follows:

The Maintenance of Shop and Enginehouse Roofs—G. S. Crites (chairman), div. engr., B. & O., Punxsutawney, Pa.; L. C. Winkelhaus (vice-chairman), arch., C. & N. W., Chicago; P. Aagaard, gen'l. bldg. insp., I. C., Chicago; M. A. Beringer, b. & b. foreman, Y. & M. V., Baton Rouge, La.; W. R. Ganser, mast. carp., L. I., Jamaica, N. Y.; E. A. Gephart, b. & b. supv'r., Alton, Bloomington, Ill.; F. A. Haley, b. & b. insp., N. Y. C., Brewster, N. Y.; W. F. Meyers, b. & b. supvr., C. & N. W., Boone, Iowa; F. A. Scites, b. & b. supvr., C. & O., Huntington, W. Va.; E. W. Singer, b. & b. supvr., N. Y. C. & St. L., Ft. Wayne, Ind.; O. W. Stephens, track supvr., D. & H., Oneonta, N. Y.; C. R. Taggart, b. & b. foreman, C. C. C. & St. L., Indianapolis, Ind.; R. E. Wait, b. & b. supvr., Wabash, Decatur, Ill.; W. Walkden, bridge engr., Canadian National, Winnipeg, Man.; C. F. Weir, b. & b. supvr., P. M., St. Thomas, Ont.

Deteriorated Concrete—Causes, Detection and Methods of Repairs—S. T. Corey (chairman), asst. bridge engr., C. R. I. & P., Chicago; C. U. Smith (vice-chairman), g. m. & ch. engr., Harbor Commission, Milwaukee, Wis.; Maxfield Bear, ch. conc. insp., C. & N. W., Chicago; E. H. Brown, bldg. supt., N. P., St. Paul, Minn.; F. G. Elmquist, bridge insp., C. M. St. P. & P., Chicago; J. S. Hancock, bridge engr., D. T. & I., Dearborn, Mich.; O. J. Hein, drftsmn., C. & N. W., Chicago; W. J. Lacy, b. & b. supvr., M. P., Jefferson City, Mo.; C. A. Landstrom, mast. carp., C. B. & Q., Burlington, Iowa; W. J. Martindale, bridge foreman, T. H. & B., Hamilton, Ont.; L. R. Morgan, transitman, N. Y. C., Syracuse, N. Y.; W. V. Parker, const. engr., Memphis, Tenn.; C. A. J. Richards, mast. carp., Penna., Chicago; E. E. R. Tratman, civil engr., Wheaton, Ill.

President-Day Methods of Safeguarding Bridge Substructures—W. R. Roof (chairman), b. & b. engr., C. G. W., Chicago; W. A. Sweet (vice-chairman), gen'd. foreman b. & b., A. T. & S. F., Newton, Kan.; L. B. Alexander, asst. bridge engr., M. C., Detroit, Mich.; B. F. Cary, b. & b. supvr., Sou., Alexandria, Va.; S. D. Fournier, bridge insp., P. M., Detroit, Mich.; H. M. Harlow, asst. supvr. b. & b., Chesapeake & Ohio, Clifton Forge, Va.; C. S. Heritage, bridge engr., K. C. S., Kansas City, Mo.; C. T. Kaier, gen'l. bridge insp., D. L. & W., Hoboken, N. J.; F. H. Masters, ch. engr., E. J. & E., Joliet, Ill.; E. M. McCabe, b. & b. supvr., B. & A., Pittsfield, Mass.; K. L. Miner, b. & b. supvr., N. Y. C., Beacon, N. Y.; N. W. Morgan, bridge engr., U. S. Bureau of Public Roads, Washington, D. C.; E. T. Richie, mast. carp., D. & R. G. W., Pueblo, Colo.; A. B. Scowden, gen'l. bridge insp., B. & O., Cincinnati, Ohio; T. H. Strate, div. engr., C. M. St. P. & P., Milwaukee, Wis.; H. A. Wistrich, bridge engr., L. V., Bethlehem, Pa.

Bridge Painting Problems Resulting from Deferred Maintenance; R. W. Johnson (chairman), asst. engr., C. M. St. P. & P., Chicago; E. C. Neville (vice-cairman), b. & b. mast., C. N., Toronto, Ont.; R. E. Caudle, asst. engr. struct., M. P., Houston, Tex.; H. Cunniff, gen'l. foreman painters, D. & H., Cohoes, N. Y.; R. DeArmond, asst. b. & b. supvr., S. P., San Francisco, Cal.; M. H. Dick, eastern editor, *Railway Engineering and Maintenance*, New York; J. W. Gannon, b. & b. supvr., B. & M., Concord, N. H.; J. E. Hogan, asst. engr., C. & O., Hinton, W. Va.; C. E. Horrom, b. & b. supvr., Alton, Bloomington, Ill.; A. S. Krefting, res. engr., M. S. P. & S. S. M., Minneapolis, Minn.; J. J. LaBat, asst. supvr. b. & b., M. P., Poplar Bluff, Mo.; W. L. Smith, bridge engr., Terminal Railroad Assoc. of St. Louis, St. Louis, Mo.; J. A. Trombly, gen'l. b. & b. foreman, N. Y. N. H. & H., Hartford, Conn.; J. L. Varker, b. & b. supvr., D. & H., Carbondale, Pa.; B. M. Whitehouse, gen'l. bridge insp., C. & N. W., Chicago; J. J. Wishart, b. & b. supvr., N. Y. N. H. & H., Boston, Mass.

Pumping Equipment to Meet Today's Requirements—M. P. Walden (chairman), asst. supvr. b. & b., L. & N., Evansville, Ind.; A. C. Sachs, (vice-chairman), gen'l. foreman w. s., C. N., London, Ont.; F. W. Alen, gen'l. electric foreman, N. Y. C., Abany, N. Y.; R. C. Bardwell, supt. water supply, C. & O., Richmond, Va.; R. T. Burns, supvr. water service, C. & N. W., Boone, Iowa; John Cole, foreman water service, C. N., Toronto, Ont.; L. A. Cowsert, water inspector, B. & O., Dayton, Ohio; V. E. Engman, ch. carp., C. M. St. P. & P., Savanna, Ill.; Theo. Gunter, supvr. water service, M. P., St. Louis, Mo.; H. A. Horning, supt. bldgs., M. C., Jackson, Mich.; B. J. Howay, b. & b. supvr., P. M., Grand Ledge, Mich.; H. G. Johnson, draftsman, C. M. St. P. & P., Chicago; C. R. Knowles, supt. water service, I. C., Chicago; Garry Smith, foreman water service, N. Y. C., Rochester, N. Y.; W. L. Wallace, supvr. water service, P. M., Saginaw, Mich.; A. H. Frisbie, div. gen'l. water supvy foreman, C. & N. W., Sioux City, Iowa.

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ing supvr., M. P., Monroe, Louisiana.

Revision of Bridge Maintenance Methods to Eliminate Slow Orders—H. B. Christianson (chairman), div. engr., C. M. St. P. & P., Savanna, Ill.; T. W. Pinard (vice-chairman), b. & b. engr., Penna., New York; J. E. Bird, asst. supvr. b. & b., N.Y.C., Corning, New York; H. M. Buell, bridge insp., U. P., Omaha, Neb.; R. W. Cook, gen'l. bridge insp., S. A. L., Norfolk, Va.; F. H. Cramer, asst. bridge engr., C. B. & Q., Chicago; E. E. Fobes, asst. supvr. b. & b., N. Y. C., Albany, N. Y.; R. L. Fox, rdm., Sou., Alexandria, Va.; F. C. Huntsman, office engr., Wabash, St. Louis, Mo.; D. E. Lewis, gen'l. foreman, b. & b., A. T. & S. F., Winslow, Ariz.; W. E. Maley, mast. carp., B. & O., Punxsutawney, Pa.; D. A. Manning, b. & b. supvr., C. & N. W., Chicago; I. A. Moore, b. & b. supvr., C. & E. I., Danville, Ill.; J. M. Salmon, Jr., asst. supvr. b. & b., L. & N., Louisville, Ky.; I. L. Simmons, bridge engr., C. R. I. & P., Chicago; J. G. Stice, bridge insp., I. C., Chicago.

Supply Trade News

General

The Flexrock Company has moved its general office and plant from 800 North Delaware avenue to larger quarters at 23rd and Manning streets, Philadelphia, Pa.

The Insulite Company, Minneapolis, Minn., has completed the construction of a plant at South Kearny, N.J., for the manufacture and processing of insulated brick siding.

The Hunter Manufacturing Company has moved its office from 25 Broadway to 444 Madison avenue, New York City. The company has appointed the following companies as distributors of the Rex Emergency Carbide Light in the railroad industry: The Rails Company, New York City and New Haven, Conn.; the Industrial & Railroad Supply Company, 310 South Michigan boulevard, Chicago; The Railway Equipment Company, 757 Paul Brown building, St. Louis Mo.; and Moffett & Romig, Hill building, Washington, D.C.

Personal

J. C. Rinehart, sales manager for A. P. DeSanno & Sons, Philadelphia, Pa., has been elected vice-president of the **Eagle Grinding Wheel Company,** Chicago.

W. H. Kofmehl, general supervisor of the **Oxweld Railroad Service Company,** Chicago, has retired on pension. Mr. Kofmehl was for many years a roadmaster on the Chicago-Savanna, Ill., line of the Chicago, Milwaukee, St. Paul & Pacific, and was the first roadmaster to equip his district completely with motor cars. Mr. Kofmehl left railway service to enter the railway supply field in 1916, shortly thereafter becoming connected with the Oxweld Railroad Service Company. He has long taken an active part in the Roadmasters and Maintenance of Way Association, having served that organization as treasurer from 1915 to 1917.

Gilbert E. Webster, who has been associated with the St. Louis, Mo., agency of the National Lock Washer Company, Newark,

Gilbert E. Webster

N. J., has been appointed sales manager of its track spring washer department, with headquarters at Newark. Mr. Webster was born on November 23, 1900, at Odon, Ind., and in addition to a public school education he studied at a military school at Mexico, Mo. He began his business career in 1918, with the Illinois Central, serving as a clerk, statistician and chief clerk on the Illinois division of this road until 1922. From 1923 to 1938, Mr. Webster was associated with the P. & M. Company as foundry sales representative and southwestern sales agent. During part of this period he was also associated with the southwestern sales representative of the National Lock Washer Company.

George W. Morrow, for the last 13 years a sales representative of the **Ingersoll-Rand Company,** in Chicago, in charge of maintenance of way and bridge and building equipment sales, has been appointed general sales manager of the **Reade Manufacturing Co., Inc.,** Jersey City, N.J. Mr. Morrow, who will be in

George W. Morrow

charge of all railway sales of this company, will be located at a new sales office established by the company at 9 So. Clinton street, Chicago.

Mr. Morrow was born at Hackensack, N.J., on January 21, 1891. He spent 19 years with the New York, New Haven & Hartford, including ten as supervisor of track. On June 1, 1926, he became associated with the Ingersoll-Rand Company. Mr. Morrow has been actively associated with a number of railway clubs, including the Metropolitan Track Supervisors' Club, of which he was president in 1921, and the Roadmasters and Maintenance of Way Association, of which he was president in 1926. He is now a director of the Maintenance of Way Club of Chicago and of the Bridge and Building Supply Men's Association.

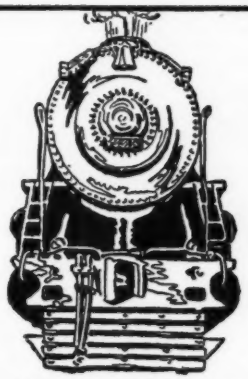
Lem Adams, chief engineer of the **Oxweld Railroad Service Company,** Chicago, has been elected vice-president, with headquarters as before in Chicago.

Mr. Adams was graduated in civil engineering, from the Texas Agricultural and Mechanical College and entered railway service in June, 1909, in the engineering department of the Union Pacific as a rodman. In June, 1911, he was made an estimator and served in this position and as chief draftsman until March, 1916, when he was promoted to assistant divi-

Lem Adams

sion engineer. Mr. Adams was appointed an engineering accountant in the following year, and in 1918 he became contract engineer. After a year in this position, he was transferred to the Union Pacific unit of the System with the title of special field engineer in the maintenance of way department, then being advanced to roadway assistant for the System at Omaha in April, 1920. On May 15, 1929, Mr. Adams was further promoted to general supervisor maintenance of way for the System at Omaha, which position he retained until September 16, 1931, when he was appointed engineer maintenance of way of the System. In January, 1933, he was promoted to chief engineer of the Union Pacific and of the St. Joseph & Grand Island. In August of that year, he resigned to become chief engineer of The Oxweld Railroad Service Company. Mr. Adams has taken an active part in railroad associations and technical societies. He was formerly a member of the Board of Direction of the American Railway Engineering Association. He is now president of the Track Supply Association.

Compare!



TON-MILES of REVENUE FREIGHT
(in thousands)
335,851,069

Jan. 1st - Nov. 30th
1937

21
FISSURES FOUND
per 100 Track Miles Tested
(Total, for 11 months: 15,572)

TON-MILES of REVENUE FREIGHT
(in thousands)
264,557,049

Jan. 1st - Nov. 30th
1938

25
FISSURES FOUND
per 100 Track Miles Tested
(Total, for 11 months: 17,134)

Less Traffic but More Fissures

Reasons: ❶ Train Speeds increased generally
❷ Rail Renewal deferred

Only frequent, periodic testing can maintain maximum Safety!

Hoboken, N. J. **SPERRY RAIL SERVICE** Chicago, Ill.

ALPHABETICAL INDEX TO ADVERTISERS

and list of their products

Ingersoll-Rand....122
11 Broadway, New York City.
Air Compressors; Air Hoists; Air Lift Pumping System; Chipping Hammers; Compressors; Condensers; Hammers; Chipping, Calking, Riveting, Rock Sealing; Hose; Pavement Breakers; Pneumatic Tools; Portable Grinders; Rail Bonding Outfits; Screw Spike Drivers; Tie Tampers.

Ingot Iron Railway Products Company....118
Middletown, Ohio.
Asbestos Bonded Pipe; Automatic Drain Gates; Bin-Type Retaining Walls; Bridge Decking; Corrugated Metal Pipe; Culverts; Metal Cribbing; Multi-Plate Arches; Multi-Plate Pipe; Paved Invert Pipe; Part Circle Culverts; Perforated Pipe; Pile Shells; Pipe Arches; Sheet Piling; Spiral Welded Pipe; Steel Roof Decks; Structural Steel Plate Lining.

International Harvester Company, Inc.....195
180 North Michigan Avenue, Chicago, Illinois.
Tractors; Trucks.

Layne & Bowler, Inc.....204
Memphis, Tennessee.
Pumps; Water Supply Contractors; Well systems.

Lufkin Rule Co., The....200
Saginaw, Michigan.
Gages, Measuring; Rules; Scales, Steel Measuring; Tapes, Measuring; Micrometers; Tools, Machinists.

Maintenance Equipment Company....119
80 East Jackson Blvd., Chicago, Illinois.
Friction Car Stops; Rail and Flange Lubricators; Rail Layers, Hand and Power; Reversible Switch Point Protectors; Universal Portable Derails.

Mall Tool Company....201
7746 So. Chicago Ave., Chicago, Illinois.
Grinders, Rail.

Morden Frog and Crossing Works....203
8 So. Michigan Ave., Chicago, Illinois.
Articulated Crossings; Balkwill Crossings; Compromise Joints; Frogs; GEO Track Designs; Gage Rods; Guard Rails; Rail Braces; Switches.

Morrison Metalweld Process, Inc.....201
1437 Bailey Avenue, Buffalo, New York.
See Morrison Railway Supply Corp.

Morrison Railway Supply Corp.....201
1437 Bailey Avenue, Buffalo, New York.
Rail Welding; Switch Point Guards; Portable Heater; Wood Preservation.

National Carbide Corporation....200
Lincoln Building, New York City.
Calcium Carbide; Carbide Lamps; Lights.

National Lead Company....207
111 Broadway, New York City.
Red Lead.

Nordberg Mfg. Co.....120-121
Milwaukee, Wisconsin.
Adzing Machines; Power Jacks; Rail Drills; Rail Grinders; Spike Pullers; Track Shifter; Track Wrenches.

Osmose Wood Preserving Co.....201
1437 Bailey Avenue, Buffalo, New York.
See Morrison Railway Supply Corp.

Oxweld Railroad Service Company, The....129
230 No. Michigan Ave., Chicago, Illinois.
Acetylene Appliances; Acetylene, Dissolved; Joint Bar Reconditioning Equipment; Calcium Carbide; Carbide Lanterns; Floodlights; Frog and Crossing Reconditioning Equipment; Gas, Acetylene, Gas Products; Generators, Acetylene; Hard-Facing Materials; Oxygen; Oxy-acetylene Cutting and Welding Equipment; Rail Bonding Equipment; Rail End Hardening Equipment; Rail Reconditioning Equipment; Rail Welding Equipment; Switch Point Reconditioning Equipment; Torches, Oxy-acetylene Cutting, Welding and Heat Treating; Welding Rods.

P. & M. Co., The....113
80 East Jackson Boulevard, Chicago, Illinois.
Rail Anchors; Rail Anti-Creepers.

Pettibone Mulliken Corporation....128
4710 W. Division St., Chicago, Illinois.
Crossings, Permanent Base; Frogs; Guard Rails; Mechanical Switchman; Switch Stands; Switches.

Pittsburgh Screw and Bolt Corporation....131
Pittsburgh, Pennsylvania.
Bolts, Blank, Bridge, Carriage, Fitting Up, Foundation, Lag, Machine, Rods, Stud, Track, Truss; Dowels, Giant Grip; Nuts, Case Hardened, Cold Punched, Finished, Hot Pressed, Rivets, Semi-finished, Washers; Spikes, Double Grip.

Portland Cement Association....126
33 West Grand Ave., Chicago, Illinois.
Cement; Concrete Piles; Precast Concrete; Trestle Deck Slabs.

Pressed Steel Car Co.....191
Pittsburgh, Pennsylvania.
Cars: Industrial and Dump Cars.

Q & C Co., The....138
90 West St., New York City.
Anti-slip Rail Tongs; Car Replacers; Compromise Joints; Derails; Electric Snow Melters; Flangeway Brackets; Foot and Heel Guards; Gage Rods; Guard Rail Clamps; Insulated Rail Joints; One Piece Manganese Guard Rails; Rail Benders; Sentry Signal; Skid Shoes; Snow Flangers and Plows; Rail and Flange Lubricator; Switch Point Guards; Wheel Stops.

Rail Joint Company, Inc., The....132
50 Church Street, New York City.
Compromise Joints; Insulated Rail Joints; Rail Joints; Step Joints.

Railroad Accessories Corporation....115
405 Lexington Ave., New York City.
Drills, Rail; Power Track Machine; Tie Boring Machine.

Rails Company, The....208
50 Church St., New York City.
Track Construction; Track Fastenings.

Railway Track-work Co.....199
3132-48 East Thompson Street, Philadelphia, Pennsylvania.
Abrasives; Cross Grinders; Rail Grinders; Rail Grinding Wheels and Blocks; Track Grinders.

Reliance Spring Washer Division....114
Massillon, Ohio.
See Eaton Manufacturing Company.

Simmons-Boardman Publishing Corporation....198-202-204
105 West Adams Street, Chicago, Illinois.

Sperry Rail Service....197
1505 Willow Avenue, Hoboken, New Jersey.
Detector Car Testing Rails in Track; Rail Butt Welding.

Syntron Company....200
Homer City, Pennsylvania.
Electric Power Units; Drills, Electric; Grinders, Portable Track; Power Plants, Portable; Tie Tampers; Tools, Electric.

Templeton, Kenly & Co.....203
1020 So. Central Ave., Chicago, Illinois.
Jacks, Track; Rail Puller & Expanders.

Timber Engineering Company....203
1337 Connecticut Avenue, N. W., Washington, D. C.
Timber Joint Connectors.

Timken Roller Bearing Company, The....130
Canton, Ohio.
Bearings, Hand Car, Journal Box, Motor, Push Car, Tapered Roller, Thrust; Steel, Electric Furnace, Open Hearth Special Analysis; Tubing, Seamless Steel.

Union Carbide and Carbon Corporation....129
30 East 42nd Street, New York City.
See Oxweld Railroad Service Co.

U. S. Steel Corporation Subsidiary....124
Alloy Steel; Bars; Bolts; Cement; Fencing; Fence Posts; GEO Track Construction; Guard Rails; Joint Fastenings; Nuts; Rail Joints; Rails; Screw Spikes; Sheet Piling; Steel Alloy; Steel Plates and Shapes; Structural Steel; Tee Rails; Tie Plates; Ties; Tubing; Wire and Wire Products.

United States Steel Products Company....124
See U. S. Steel Corporation Subsidiary.

Warren Tool Corporation....136
Warren, Ohio.
Adzes; Claw Bars; Flatters; Picks; Sledges; Spike Mauls; Track Chisels; Wrenches.

Woolery Machine Company....193
29th & Como Ave., S. E., Minneapolis, Minnesota.
Bearings, Axle; Cars, Inspection, Motor, Section; Engines, Gasoline, Motor Car; Tie Cutting Machine; Weed Burner.

ONCE AGAIN RUST MISSES A BANQUET

DUTCH BOY RED-LEAD

TAKE a hard-boiled look at the record of Dutch Boy Red-Lead. You find it used—and re-used—by practically every great American industry. You find it constantly on duty protecting millions of square feet of metal surfaces—doing a first-rate job in spite of the most adverse conditions. *So no one can be called an experimenter—or a chance taker—when he specifies Dutch Boy Red-Lead.*

First and foremost, this paint has "stick-to-itiveness." It takes hold and holds fast. At the same time, it is highly elastic—expansion or contraction of the metal surface does not loosen its grip. It not only keeps out moisture but also resists the destructive action of other common causes of corrosion—such as gases, smoke and salt water.

Dutch Boy Red-Lead comes in both paste and liquid form, the latter including a quick-drying type for use when allowable drying time is short. The pigment in every case is pure red-lead that contains more than 97% Pb_3O_4, thus assuring easier application, higher spreading rate and a uniform film of greater density.

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Better Track

COMPRESSION Track Fastening

Compression Spring Clips afford:

1—Positive two-way holding of the rail.

2—Protection against the rocking and slewing of ties with subsequent tie re-spacing and surfacing costs.

3—The maintenance of uniform expansion gaps at rail ends.

4—The reduction of joint wear and joint maintenance costs.

5—The ability to deliver full efficiency in track from *each and every Spring Clip.*

Compression Spring Clips are in service on over 40 railroads.

They fit all standard tie plates, single or double shouldered.

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